re: **Geotechnical Response to Peer Review Comments**
Proposed Residential Development – Conservancy
Borrisokane Road - Ottawa

to: Caivan Communities – **Mr. Hugo Lalonde –** hugo.lalonde@caivan.com

date: June 3, 2021

file: PG5036-MEMO.01 Rev. 1

Further to your request, Paterson Group (Paterson) prepared the current memorandum to provide a more detailed breakdown regarding our permissible grade raise evaluation process. The current memorandum report should be considered our full response to the recent round of peer review comments. It is expected that City staff will be reviewing/approving our responses based on our recent meeting, which was intended to help clarify the Paterson report recommendations and our experience with clay soils across the subject site and adjacent development sites. It should be noted that the permissible grade raise recommendation presented in our original geotechnical report was designed for the housing. The permissible grade raise for the roadways can be higher than those for the housing due to the building loading consideration. Our updated geotechnical Report PG5036-1 Revision 2 dated May 25, 2021 provides clarification for the permissible grade raise recommendation.

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Item 1 – Permissible Grade Raise

As noted in Paterson Report PG5036-1 Revision 2 dated May 25, 2021, our permissible grade raise recommendations are based on the consolidation testing results, test fill settlement monitoring results and undrained shear strength values at the borehole locations and our experience with local Ottawa clays. It should be noted that the undrained shear strength values and clay crust thicknesses noted at the borehole locations across the site are similar to soil profiles encountered by Paterson at adjacent sites in the vicinity of subject site. We have also successfully completed several surcharge and settlement test fill monitoring programs at these same adjacent sites, which have helped us to identify accurate permissible grade raise recommendations for those clay deposits. The successful development of those adjacent sites has further confirmed that our design assumptions used for determining the permissible grade raise recommendations are suitable for residential developments over sensitive silty clay deposits.

To elaborate on our process, we have used the similarities of the area clay deposits and the results of the settlement test fill program that is underway for the subject site to confirm our permissible grade raise recommendations for the site. The latest results of the settlement test fill program are presented in Figure 2 attached. Test fill piles, Pile E and EE, are located in the area of the highest roadway grade raise for the site. The test fill pile locations (Piles E and EE) and top of test fill pile elevations are presented in Figure 1 on the following page.

The settlement monitoring results for Piles E and EE to date are indicative of acceptable settlement levels for roadways and associated service pipes for proposed grade raises of up to **2.3 m (el. 93.3 m)** without excessive settlement. Based on the testing results, the majority of the settlement associated with the grade raise occurs within the first 3 to 4 months after fill placement and it should be noted that the placement of service pipes will occur well beyond that timeline. The highest finished roadway grades are also 0.6 m to 1.0 m below the top of the top of Piles E and EE, respectively. Therefore, the service pipe alignments are expected to have to tolerate a minor amount of settlement ranging between 15 to 20 mm. This amount of settlement is tolerable for conventional water, sanitary and storm pipe materials and conventional connections for manholes and catch basins.

The area presented in Figure 1 is representative of the highest grade raises for the subject roadways at the subject site. The required grade raise above original ground surface varies between 1.5 to 2.3 m (max. el. 93.3 m). Therefore, based on our observations of the settlement monitoring program, the underlying soil profile across the site and our knowledge of settlement and clay deposits in the area, Paterson can confirm that the proposed roadway grading is acceptable from a geotechnical perspective and lightweight fill will not be required for the subject roadway alignments.

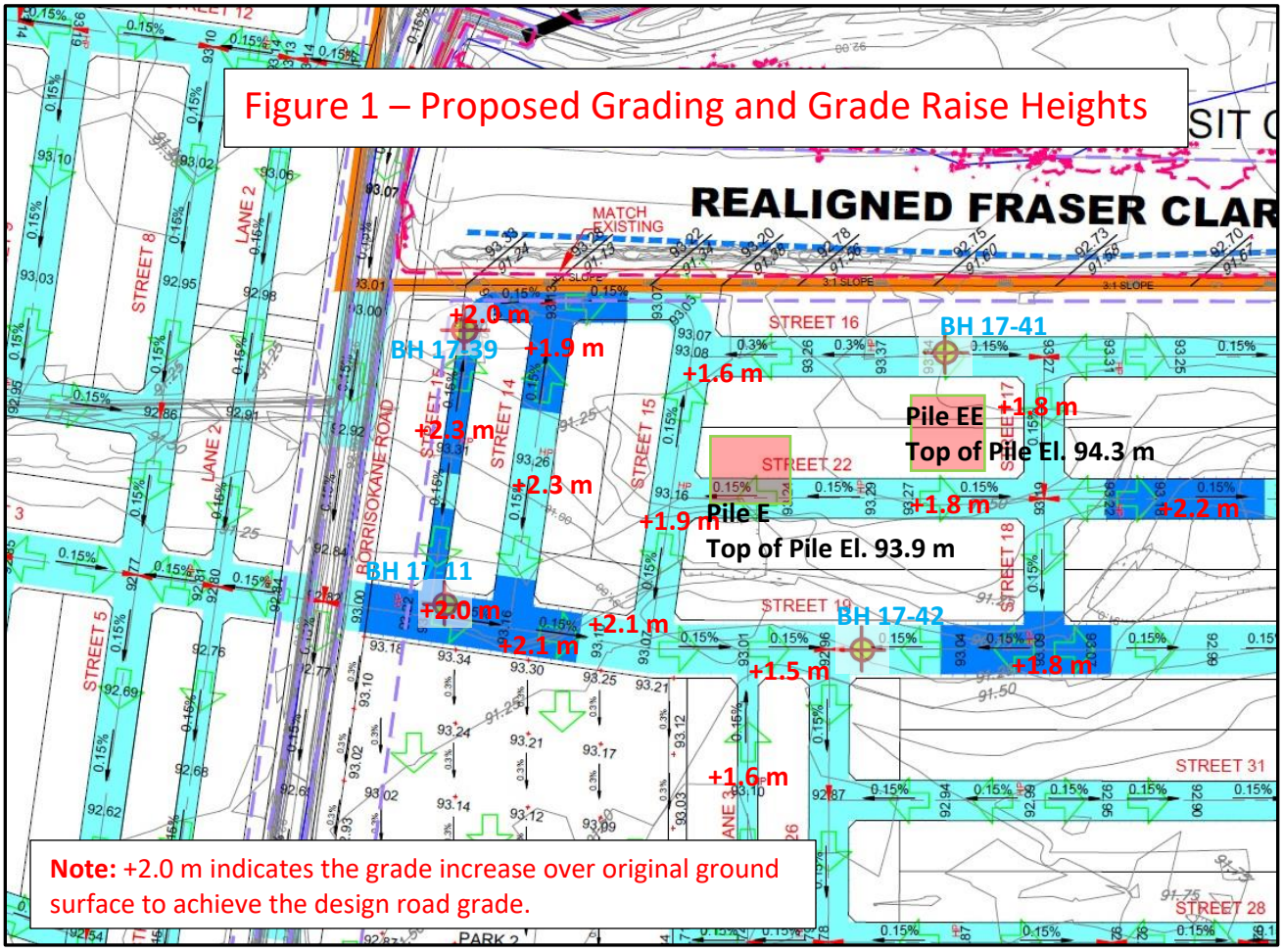


Figure 1 – Proposed Grading and Grade Raise Heights

Paterson has also included the results of a test fill settlement monitoring program for Phase 1 of the Half Moon Bay West development as part of the current submission. The Soil Profile and Test Data sheets for the boreholes in close proximity to the test fill piles within Phase 1 are also attached. The test fill pile settlement data and borehole soil profile that was observed at the HMB West development is considered to have contributed to our approach and analysis to the permissible grade raise recommendations for the Conservancy East development.

We have also included the borehole logs and grading plan review memo with our permissible grade raise recommendations for the Harmony development, which is located north of the Conservancy development. The soil profile below the Harmony – Stage 2 site is similar to the subject site. It should be noted that Stage 2 of the Harmony development has been constructed for a number of years and no signs of settlement are observed within the development. The permissible grade raise recommendations range between 1.9 to 2.1 m for housing at Stage 2 of the Harmony development (Drawing PG1984-9 – Permissible Grade Raise Plan) and it should be noted that the permissible grade raise recommendation for the roadways was 2.6 m.

It is expected that the back-up information from the adjacent sites should sufficiently support our permissible grade raise approach that has applied to the Conservancy site.

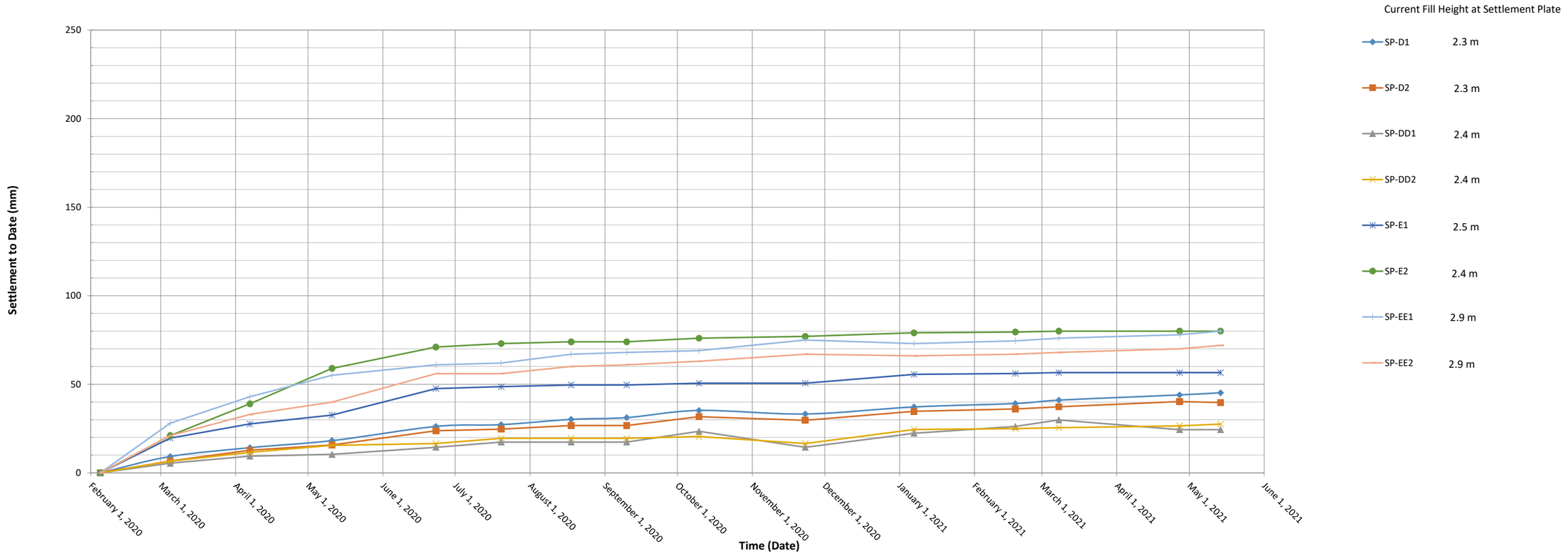
We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

David J. Gilbert, P.Eng.

Figure 2 - Test Fill Pile Settlement Monitoring Program
Caivan - Conservancy Lands East - Borrisokane Road - Ottawa



EXISTING STORM POND

CITY LANDS

CITY LANDS

BORRISOKANE

STRANDHERD DRIVE

FUTURE EMPLOYMENT

FUTURE SCHOOL

PHASE I

FUTURE TRANSIT CORRIDOR

EXTENT OF TEST FILL PILES

WEST PHASE

MIXED USE

HIGH DENSITY

NEIGHBORHOOD PARK

NEIGHBORHOOD PARK

Pile E

Pile EE

17-06 91.22
17-31 91.20
17-32/32A 91.05
17-35 91.04
17-40 91.21
17-33 91.53
17-34 91.25
17-08 91.15
17-38/38A 91.24
17-07/07A 91.56
17-36/36A 91.35
17-37 91.08
17-39 91.23
17-11 91.19
17-40 91.27
17-41 91.51
17-42 91.16
17-43/43A 91.52
17-44 91.54
17-12 91.47
17-45 91.60
17-46/46A 91.63
17-47 91.53
17-48 91.54
17-49 91.64
17-13 91.68
17-50 91.44
17-51 91.43
17-52/52A 91.43
17-53 91.51
18-20 91.29
17-14 91.27
17-55 91.44
18-21 91.36
18-31 91.06
18-30 90.95
18-29 91.04
17-60 91.23
17-58 91.37
18-22 91.31
18-32 90.83
18-23 91.32
18-24 91.23
18-33 91.13
18-34 91.30
18-35 91.56
18-15 91.23
18-16 91.48
18-17 91.47
18-18 91.54
18-19 91.26
18-28 91.17
18-25 91.24
18-26 91.45
18-27 91.38
18-36 91.19
18-37 91.29

SWM

SWM

SWM

JOCK RIVER OPEN SPACE

JOCK RIVER OPEN SPACE

JOCK RIVER

JOCK RIVER

PERMISSIBLE GRADE RAISES:

- UP TO 1.4m
- UP TO 1.6m
- UP TO 1.8m
- UP TO 2.0m
- UP TO 2.2m

LEGEND:

- APPROXIMATE BOREHOLE LOCATION (GOLDER ASSOCIATES, 04/2019)
- 91.56 GROUND SURFACE ELEVATION (m)

BOREHOLE LOCATIONS WERE SURVEYED BY OTHERS AND ARE REFERENCED TO A GEODETIC DATUM.

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154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
2	REVISED CONCEPTUAL PLAN, UPDATED GRADE RAISE RESTRICTIONS	04/02/2021	OC
1	REVISED CONCEPTUAL PLAN, ADDED TEST FILL PILE INFO AND UPDATED GRADE RAISE RESTRICTIONS	14/05/2020	DJG

CAIVAN COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROP. RESIDENTIAL DEVELOPMENT - CONSERVANCY LANDS EAST
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN - Housing

Scale: 1:6000	Date: 09/2019
Drawn by: MPG	Report No.: PG5036-1
Checked by: OC	PG5036-2
Approved by: DJG	Revision No.: 2

11x17

p:\autocad drawings\geotechnical\pg50xx\pg5036\pg5035-1 thlp east land.dwg

PROJECT: 1771847

RECORD OF BOREHOLE: 17-11

SHEET 1 OF 1

LOCATION: N 5013105.9 ;E 362455.0

BORING DATE: February 15, 2017

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		91.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown; moist		0.00 / 0.08							
		(CL/CI/CH) SILTY CLAY to CLAY; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff to firm									Bentonite Seal
1					1	SS	4		W		
					2	SS	2				
2											Bentonite and Cuttings Mix
					3	SS	WH				
				88.29							
3		(CI/CH) SILTY CLAY to CLAY; grey with black organic mottling; cohesive, w>PL, soft to firm		2.90							
					4	SS	WH				Bentonite Seal
											Silica Sand
4											
											51 mm Diam. PVC #10 Slot Screen
					5	SS	WH				
5											Silica Sand
6											
					6	SS	WH				Native Backfill
7											
				83.57							
		End of Borehole		7.62							
8											WL in Screen at Elev. 90.46 m on February 21, 2017
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DG

CHECKED: SD

MIS-BHS 001 1771847.GPJ GAL-MIS.GDT 09/12/17 JEM

PROJECT: 1771847

RECORD OF BOREHOLE: 17-39

SHEET 1 OF 1

LOCATION: N 5013209.6 ;E 362401.9

BORING DATE: March 23, 2017

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		91.23							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; brown; moist		0.00							
		(CL/CI/CH) SILTY CLAY to CLAY; grey brown, contains silty sand layers (WEATHERED CRUST); cohesive, w>PL, stiff		0.15	1	GRAB	-				
1					2	SS	2		Wp W Wl		
					3	SS	2				
2								⊕ ⊕	+ +		
3				88.18							
		(CI/CH) SILTY CLAY to CLAY; grey with black organic mottling; cohesive, w>PL, firm		3.05	4	SS	WH				
4								⊕ ⊕	+ +		
					5	SS	WH				
5								⊕ ⊕	+ +		
6					6	SS	WH				
7								⊕ ⊕	+ +		
				83.61							
		End of Borehole		7.62							
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: SN

CHECKED: SD

Golder Associates

MIS-BHS 001 1771847.GPJ GAL-MIS.GDT 09/12/17 JEM

PROJECT: 1771847

RECORD OF BOREHOLE: 17-41

SHEET 1 OF 1

LOCATION: N 5013282.6 ;E 362535.2

BORING DATE: March 23, 2017

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		91.51							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; brown; moist		0.00							
		(CL/CI/CH) SILTY CLAY to CLAY; grey brown, contains sandy silt layers (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		0.13	1	GRAB	-				
1					2	SS	2				
2					3	SS	2				
3				88.46							
		(CI/CH) SILTY CLAY to CLAY; grey with black organic mottling, contains sand seams; cohesive, w>PL, firm		3.05	4	SS	WH				
4											
5					5	SS	WH				
6					6	SS	WH				
7				83.89							
		End of Borehole		7.62							
8											
9											
10											

DEPTH SCALE
1 : 50

LOGGED: SN
CHECKED: SD

Golder Associates

MIS-BHS 001 1771847.GPJ GAL-MIS.GDT 09/12/17 JEM

PROJECT: 1771847

RECORD OF BOREHOLE: 17-42

SHEET 1 OF 1

LOCATION: N 5013169.5 ;E 362589.9

BORING DATE: March 30, 2017

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		91.16							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; brown; moist		0.00							
		(CL/CI/CH) SILTY CLAY to CLAY; grey brown, contains silty sand layers (WEATHERED CRUST); cohesive, w>PL, stiff to firm		0.15	1	GRAB	-				Bentonite Seal
1					2	SS	1				
					3	SS	1				
2											
				88.42							
		(CI/CH) SILTY CLAY to CLAY; grey with black organic mottling, contains sand seams; cohesive, w>PL, soft to firm		2.74							
3					4	SS	WH				
											Cuttings
4											
					5	SS	WH				
5											
6					6	SS	WH				
											Bentonite Seal
7											Standpipe
					7	TP	PH				
8											Cuttings
9				82.02							
		End of Borehole		9.14							W.L. in Standpipe at Elev. 90.94 m on April 13, 2017
10											

DEPTH SCALE

1 : 50

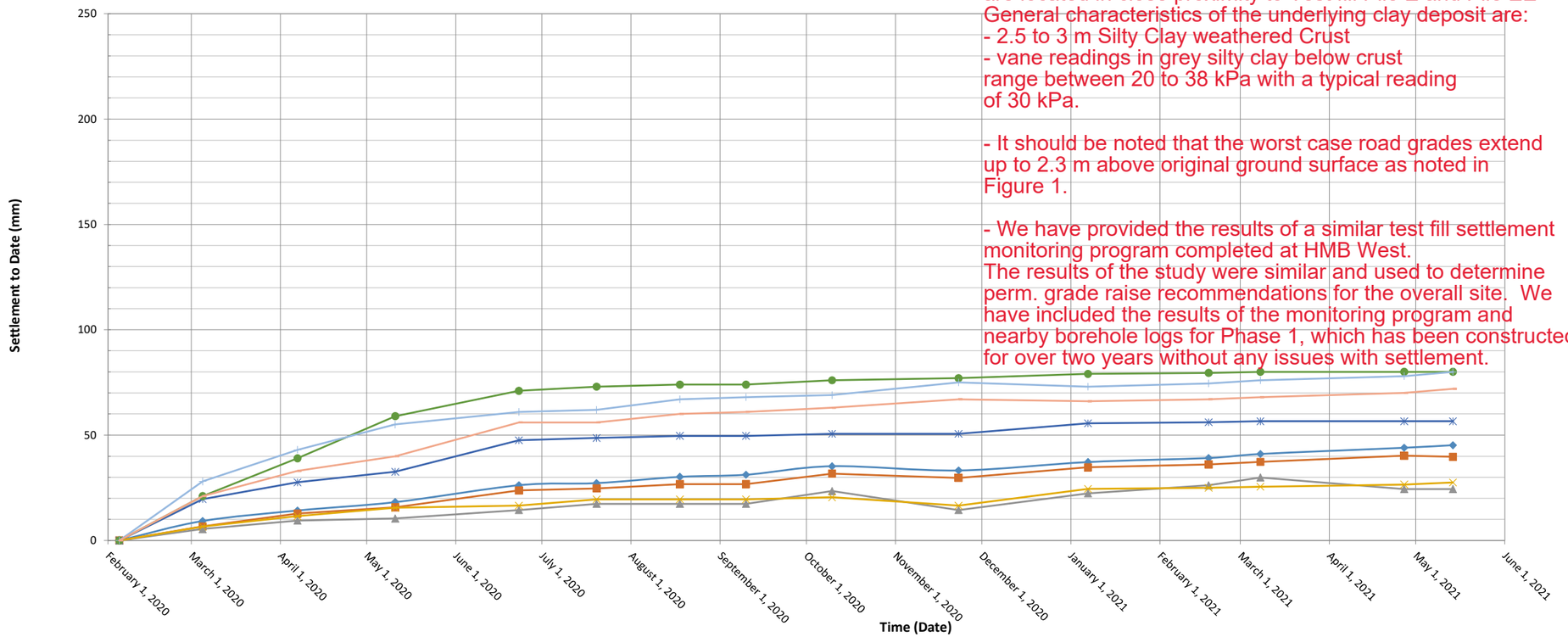
LOGGED: SN

CHECKED: SD

Golder Associates

MIS-BHS 001 1771847.GPJ GAL-MIS.GDT 09/12/17 JEM

Figure 2 - Test Fill Pile Settlement Monitoring Program
Caivan - Conservancy Lands East - Borrisokane Road - Ottawa



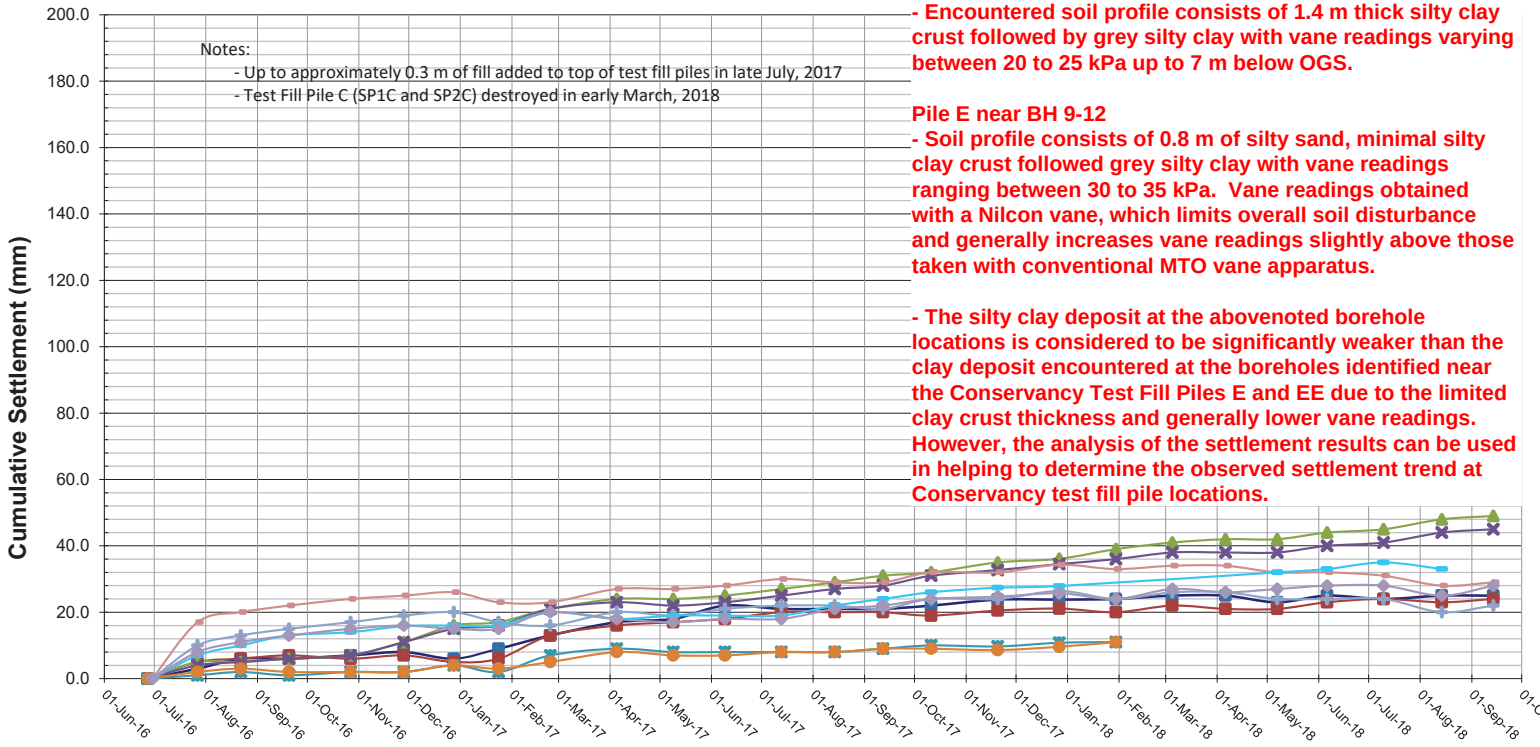
Golder BH 17-11, BH 17-39, BH 17-41 and BH 14-42 are located in close proximity to Test fill Pile E and Pile EE
General characteristics of the underlying clay deposit are:
- 2.5 to 3 m Silty Clay weathered Crust
- vane readings in grey silty clay below crust range between 20 to 38 kPa with a typical reading of 30 kPa.

- It should be noted that the worst case road grades extend up to 2.3 m above original ground surface as noted in Figure 1.

- We have provided the results of a similar test fill settlement monitoring program completed at HMB West.
The results of the study were similar and used to determine perm. grade raise recommendations for the overall site. We have included the results of the monitoring program and nearby borehole logs for Phase 1, which has been constructed for over two years without any issues with settlement.

paterson group
Ottawa Kingston North Bay

Figure 2A - Test Fill Pile Settlement Monitoring Program
Half Moon Bay West - Cambrian Road



Pile D near BH 22-08
- Encountered soil profile consists of 1.4 m thick silty clay crust followed by grey silty clay with vane readings varying between 20 to 25 kPa up to 7 m below OGS.

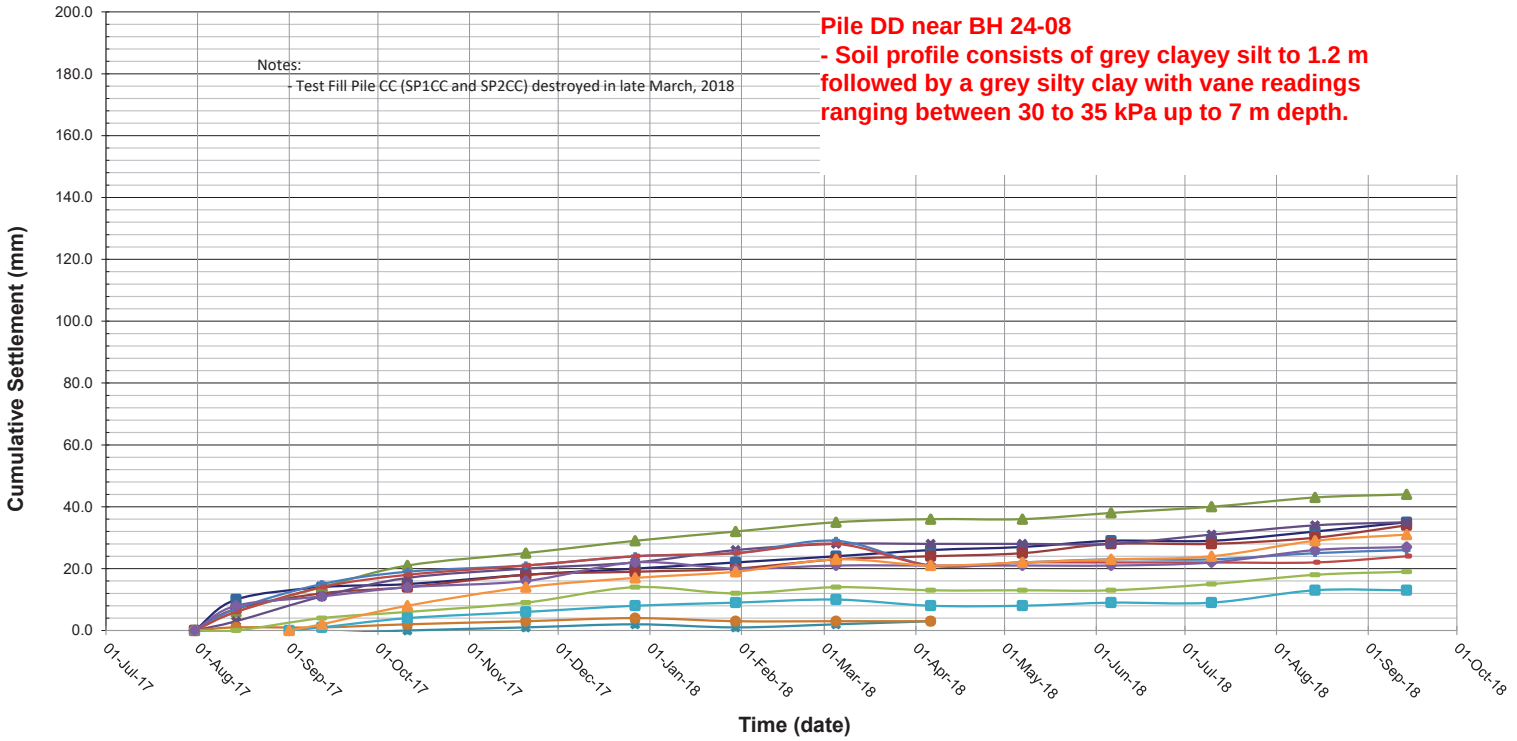
Pile E near BH 9-12
- Soil profile consists of 0.8 m of silty sand, minimal silty clay crust followed grey silty clay with vane readings ranging between 30 to 35 kPa. Vane readings obtained with a Nilcon vane, which limits overall soil disturbance and generally increases vane readings slightly above those taken with conventional MTO vane apparatus.

- The silty clay deposit at the abovenoted borehole locations is considered to be significantly weaker than the clay deposit encountered at the boreholes identified near the Conservancy Test Fill Piles E and EE due to the limited clay crust thickness and generally lower vane readings. However, the analysis of the settlement results can be used in helping to determine the observed settlement trend at Conservancy test fill pile locations.

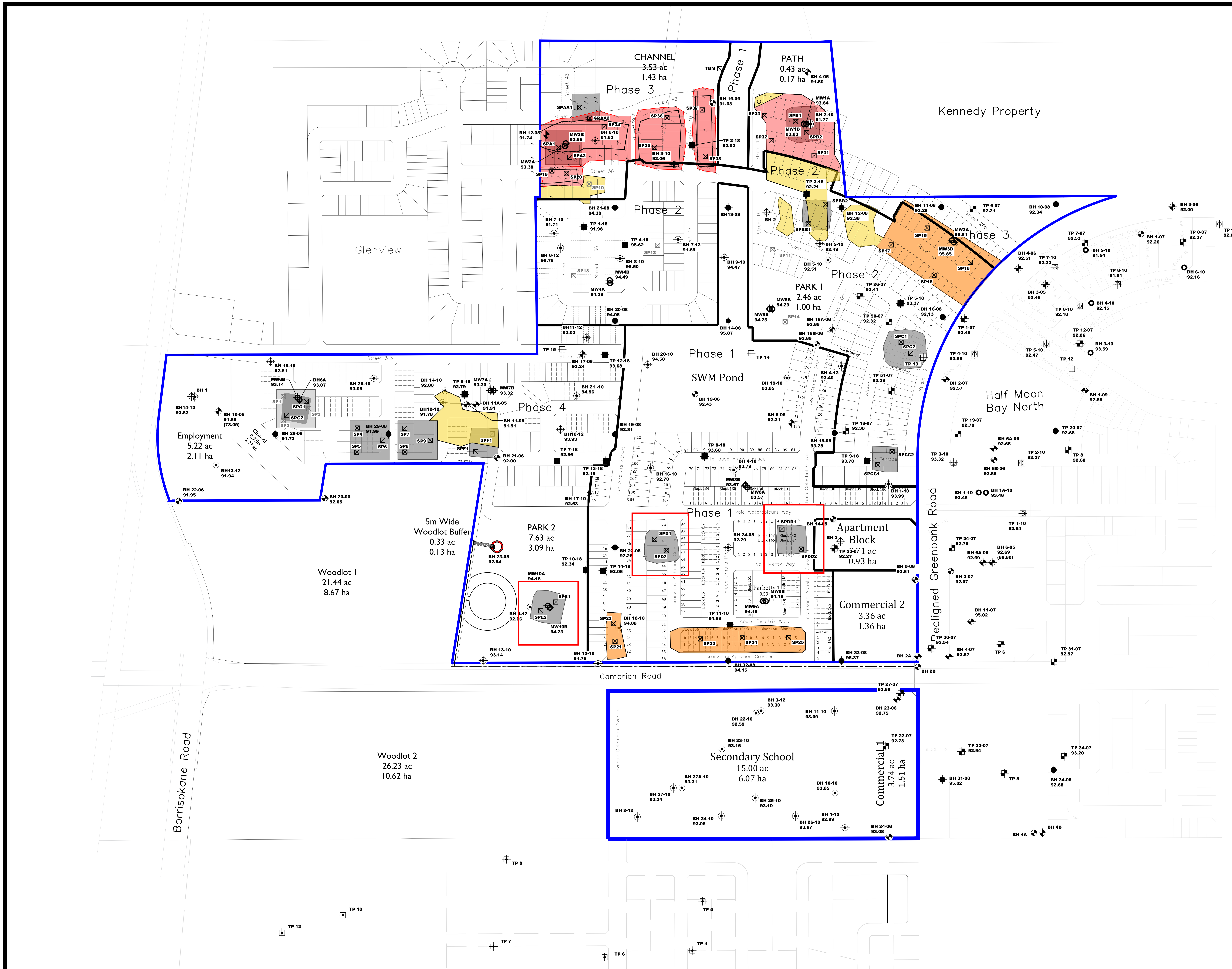
	Test Fill Pile Height at Settlement Plate	Test Fill Pile Geodetic Elevation
SP1A	2.1 m	93.8 m
SP2A	2.1 m	93.8 m
SP1B	2.2 m	94.0 m
SP2B	2.2 m	94.0 m
SP1C	2.0 m	94.1 m
SP2C	2.0 m	94.1 m
SP1D	1.9 m	94.2 m
SP2D	1.9 m	94.2 m
SP1E	2.1 m	94.4 m
SP2E	2.1 m	94.4 m

paterson group
Ottawa Kingston North Bay

Figure 2B - Test Fill Pile Settlement Monitoring Program
Half Moon Bay West - Cambrian Road



	Test Fill Pile Height at Settlement Plate	Test Fill Pile Geodetic Elevation
SP1AA	2.3 m	94.0 m
SP2AA	2.3 m	94.0 m
SP1BB	2.1 m	94.2 m
SP2BB	2.1 m	94.2 m
SP1CC	2.0 m	94.3 m
SP2CC	2.0 m	94.3 m
SP1DD	2.2 m	94.5 m
SP2DD	2.2 m	94.5 m
SP1F	2.0 m	94.0 m
SP2F	2.0 m	94.0 m
SP1G	1.9 m	93.7 m
SP2G	1.9 m	93.7 m



LEGEND:

- ONGOING SETTLEMENT PILE
- PREVIOUS SETTLEMENT SURCHARGE MONITORING PROGRAM
- APPROX. LOCATION OF STOCKPILED FILL MATERIAL
- PREVIOUS TEST FILL PILE SETTLEMENT MONITORING PROGRAM
- MONITORING WELL LOCATION, 2017
- TEST PIT LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION - PATERSON GROUP REPORT NO. PG2246
- BOREHOLE LOCATION - PATERSON GROUP REPORT NO. PG2099
- TEST PIT LOCATION - PATERSON GROUP REPORT NO. PG2099
- BOREHOLE LOCATION - PATERSON GROUP REPORT NO. PG1914
- BOREHOLE LOCATION - PATERSON GROUP REPORT NO. PG1618
- TEST PIT LOCATION- PATERSON GROUP REPORT NO. PG0214
- BOREHOLE LOCATION - PATERSON GROUP REPORT NO. PG0177
- TEST PIT LOCATION - PATERSON GROUP REPORT NO. PG0177
- BOREHOLE LOCATION - PATERSON GROUP REPORT NO. G9132
- TEST PIT LOCATION - PATERSON GROUP PORT NO. G9132
- SETTLEMENT PLATE LOCATION

SCALE: 1:2500

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NO.	REVISIONS	DATE	INITIAL
7	UPDATED SETTLEMENT PILES	30/01/2020	RG
6	UPDATED SETTLEMENT PILES	25/03/2019	NC
5	UPDATED BASE PLAN	06/03/2019	RG
4	UPDATED SETTLEMENT PILES	29/01/2019	RG
3	NEW SETTLEMENT PLATES ADDED	19/06/2018	RG
2	SETTLEMENT PLATES SP19 TO SP25 ADDED	21/05/2018	RG
1	BASE PLAN UPDATED & 2018 TEST PITS ADDED	12/03/2018	RG

MATTAMY HOMES

GEOTECHNICAL INVESTIGATION
HALF MOON BAY WEST - CAMBRIAN ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Stamp:

Scale:	1:2500
Drawn by:	RCG
Checked by:	RG
Approved by:	DJG
Date:	03/2018
Report No.:	PG2246
Drawing No.:	PG2246-4
Revision No.:	7

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Half-Moon Bay West - Cambrian Road
Ottawa, Ontario

DATUM Ground surface elevations provided by ASL.

FILE NO. PG2246

REMARKS

HOLE NO. BH 9-12

BORINGS BY CME 55 Power Auger **DATE** March 1, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0	92.06		
PEAT 0.25									
Loose, grey **SILTY SAND,** trace clay 0.80		SS	1		2	1	91.06		
						2	90.06		
						3	89.06		
Firm, grey **SILTY CLAY**						4	88.06		
						5	87.06		
						6	86.06		
						7	85.06		
7.49									
End of Borehole									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

★ Frictionless Vane

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Half-Moon Bay West - Cambrian Road
Ottawa, Ontario

DATUM Ground surface elevations provided by ASL.

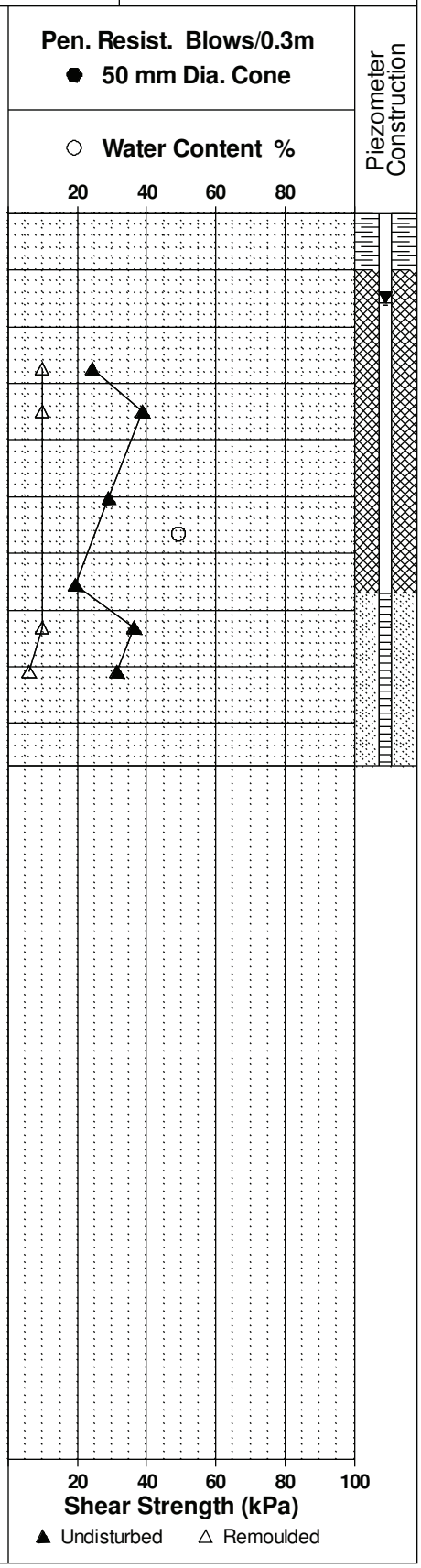
FILE NO. PG2246

REMARKS

HOLE NO. BH12-10

BORINGS BY CME 55 Power Auger **DATE** November 15, 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	94.75
FILL: Grey-brown silty clay with sand, gravel, cobbles, trace boulders		SS	1	42	3	1	93.75
1.75		SS	2	33	2	2	92.75
Soft to firm, brown **SILTY CLAY** with sand seams						3	91.75
3.65						4	90.75
		TW	3	100		5	89.75
Soft to firm, grey **SILTY CLAY**						6	88.75
						7	87.75
		TW	4	100		8	86.75
9.75		SS	5	100		9	85.75
End of Borehole							
(GWL @ 1.58m-Jan. 10/11)							



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Half-Moon Bay West - Cambrian Road
Ottawa, Ontario

DATUM Ground surface elevations provided by ASL.

FILE NO. PG2246

REMARKS

HOLE NO. BH18-10

BORINGS BY CME 75 Power Auger **DATE** February 14, 2011

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0	94.08		
FILL: Brown silty sand with gravel and cobbles, trace clay and boulders		AU	1						
		AU	2						
		SS	3	100	8	1	93.08		
1.83		SS	4	42	2	2	92.08		
Stiff, brown **SILTY CLAY** with sand seams									
2.90						3	91.08		
		TW	5	100		4	90.08		
						5	89.08		
Soft to firm, grey **SILTY CLAY**						6	88.08		
		TW	6	100		7	87.08		
						8	86.08		
9.60						9	85.08		
End of Borehole									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development-Half Moon Bay
Ottawa, Ontario

DATUM Ground surface elevation at borehole locations provided by JD Barnes.

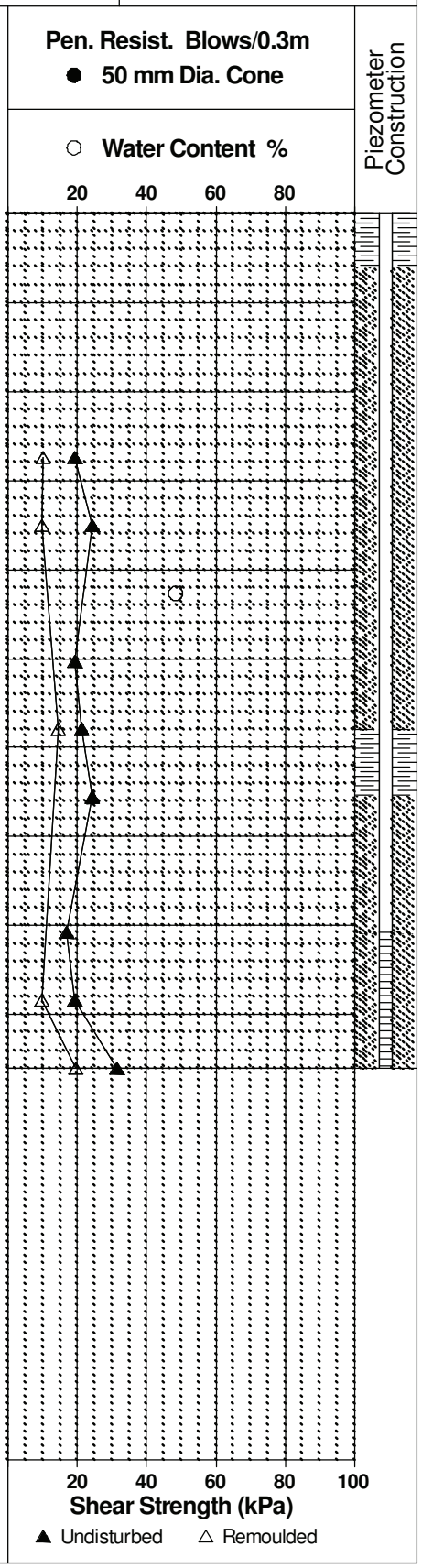
FILE NO. PG1618

REMARKS

HOLE NO. BH22-08

BORINGS BY CME 55 Power Auger **DATE** 17 March 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.26
TOPSOIL 0.20		AU	1				
Grey-brown **CLAYEY SILT**		SS	2	67	1	1	91.26
1.37		SS	3	83	1	2	90.26
						3	89.26
		TW	4			4	88.26
Soft, grey **SILTY CLAY**						5	87.26
						6	86.26
		TW	5			7	85.26
						8	84.26
						9	83.26
9.60							
End of Borehole							
(Surificial water surrounding borehole - April 9/08)							



patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development-Half Moon Bay
Ottawa, Ontario

DATUM Ground surface elevation at borehole locations provided by JD Barnes.

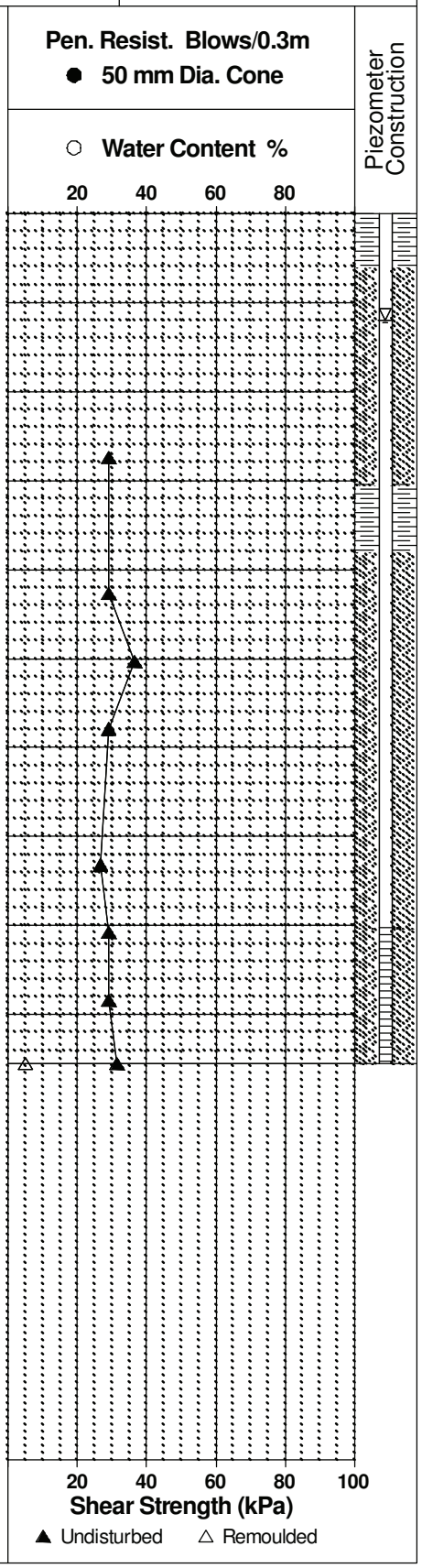
FILE NO. PG1618

REMARKS

HOLE NO. BH24-08

BORINGS BY CME 55 Power Auger **DATE** 17 March 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.29
PEAT 0.20		AU	1				
Grey **CLAYEY SILT** with sand and seashells							
1.22		SS	2	50	4	1	91.29
		SS	3	100	1	2	90.29
		TW	4	83		3	89.29
						4	88.29
Dark grey **SILTY CLAY**						5	87.29
		TW	5	100		6	86.29
						7	85.29
						8	84.29
						9	83.29
9.55							
End of Borehole							
(Surficial water surrounding borehole - April 9/08)							



patersongroup **memorandum**
consulting engineers

re: **Geotechnical Design Summary Details**
Harmony Residential Development - Stage 2
Strandherd Drive - Ottawa

to: Minto Communities Inc. - **Mr. Hugo Lalonde** - hlalonde@minto.com

date: September 17, 2019

file: PG1984-MEMO.18 Revision 4

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to provide geotechnical design summary details for Stage 2 of the Harmony residential development. The following memorandum should be read in conjunction with Report PG1984-3 Revision 2 dated December 7, 2018.

Relevant design information is presented in Tables 1 and 2 - Grading Plan Review and Foundation Design Details for the subject blocks and lots. The relevant design and inspection information includes the following:

- ❏ Legal lot/block number
- ❏ Civic addresses
- ❏ Existing grade elevation
- ❏ Proposed finished grade elevation
- ❏ Maximum permissible grade raise elevation
- ❏ Engineered fill thickness
- ❏ Proposed USF elevation
- ❏ Bearing resistance values
- ❏ Lightweight fill (LWF) recommendations
- ❏ Seismic site class

Grading Plan Review

Paterson reviewed the following grading plans prepared by J.L. Richards for Stage 2 of the aforementioned residential development:

- ❏ Drawing No. 24051-002-G1 – Rev. 11 – July 19, 2019
- ❏ Drawing No. 24051-002-G2 – Rev. 11 – July 19, 2019

Paterson reviewed the following architectural plans prepared by Minto for Stage 2 of the aforementioned residential development:

- ❏ Drawing No S-2 - Revision 3 dated August 13, 2019

Based on the grading and architectural plans provided, some lots/blocks within Stage 2 exceeded our permissible grade raise recommendations. It should be noted that the proposed grading in the architectural plans is considered to supersede the grading plans prepared by J.L. Richards. However, upon further review of these lots/blocks, the majority of proposed grades are considered acceptable from a geotechnical perspective. Where significant grade raise exceedances have occurred, lightweight fill (LWF), such as expanded polystyrene (EPS) geofoam blocks, is recommended for specific areas adjacent to the subject buildings. Table 1 and 2 attached provide a grading summary and lightweight fill (LWF) requirements for the subject buildings based on our grading plan review. LWF material specifications and cover recommendations are provided in Table 1 and 2 attached.

Outdoor Structures

The following is recommended for setbacks regarding outdoor structures:

Swimming Pools

The in-situ soils are considered to be acceptable for swimming pools. No setbacks are required for in-ground swimming pools. Above ground swimming pools must be placed at least 4 m away from the residence foundation and neighbouring foundations. Otherwise, pool construction is considered routine, and can be constructed in accordance with the manufacturer`s specifications.

Aboveground Hot Tubs

The in-situ soils are considered to be acceptable for hot tub construction. All hot tubs must be placed at least 4 m away from the residence foundation and neighbouring foundations. Otherwise, hot tub construction is considered routine, and can be constructed in accordance with the manufacturer`s specifications.

Installation of Decks or Additions

If consideration is given to construction of a deck or addition, a geotechnical consultant should be retained by the homeowner to review the site conditions. Additional grading around proposed deck or addition should not exceed permissible grade raises. Otherwise, standard construction practices are considered acceptable.

Tree Planting Restrictions

The subject site is located in an area of high sensitivity silty clay deposits with regards to tree planting. High sensitivity clay soils were encountered between the anticipated design underside of footing elevations and 3.5 m below finished grade as per City Guidelines. Based on our Atterberg limits test results, the modified plasticity index is less than the recommended 40% modified plasticity index value. The following tree planting setbacks are recommended for these low sensitivity areas. Large trees (mature height over 14 m) can be planted within these areas provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). Tree planting setback limits can be reduced to **4.5 m for small (mature height up to 7.5 m) and medium size trees (mature tree height 7.5 to 14 m)**, provided that the following conditions are met:

- ❏ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the Grading Plan. It should be noted that due to the presence of engineered fill below design underside of footing level at each residential building, this requirement has been achieved for the subject phase of the proposed development.

- ❏ A small tree must be provided with a minimum of 25 m^3 of available soils volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

- ❏ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

- ❏ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

- ❏ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.

We trust this memorandum is satisfactory for your present requirements.

Best Regards,

Paterson Group Inc.

September 17, 2019

Stephanie A. Boisvenue, P.Eng.

David Gilbert, P.Eng.

Paterson Group Inc.

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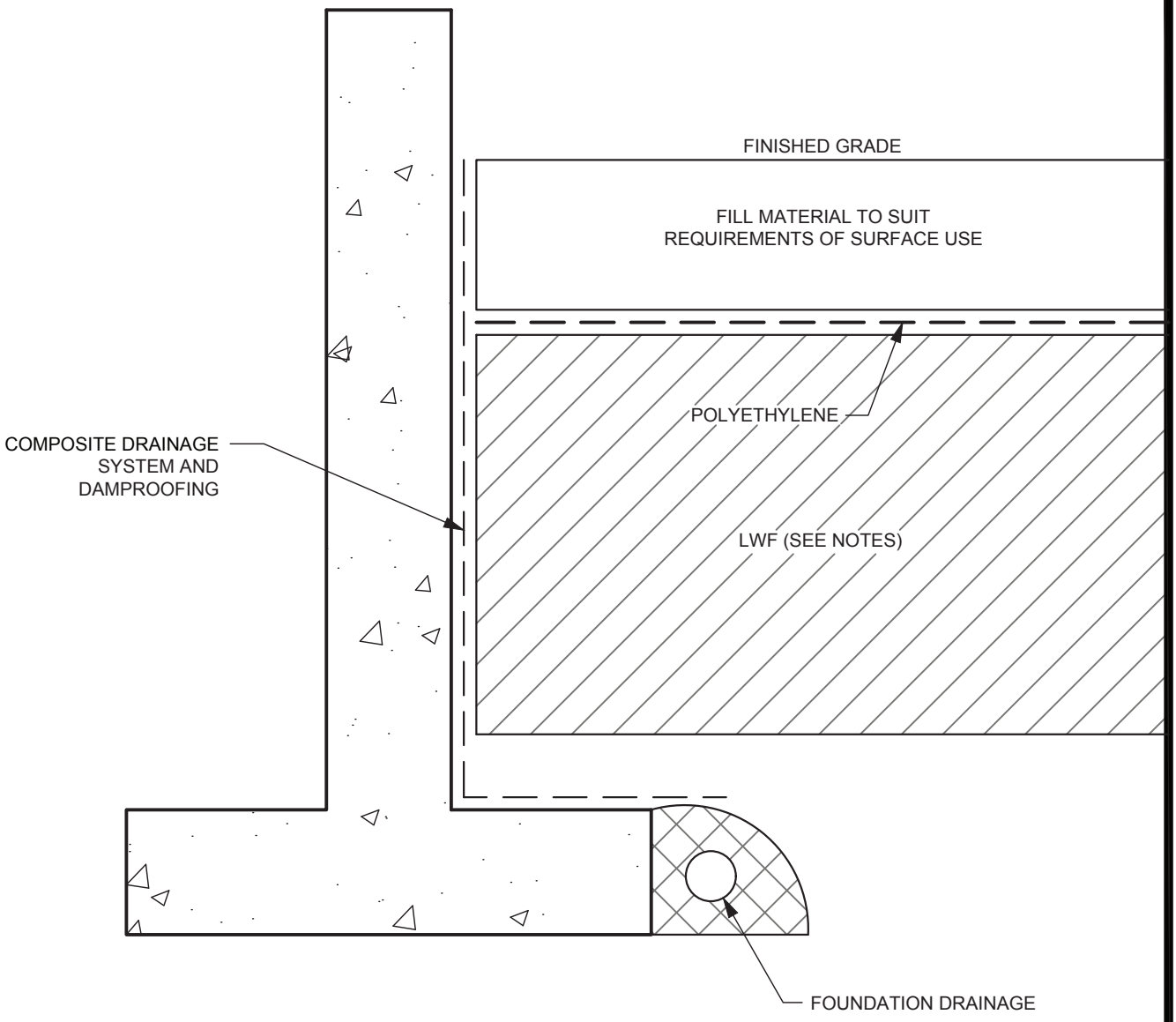


NOTES:

1. USE EPS 19 BELOW GARAGE , FRONT PORCH AND DRIVEWAY

2. USE EPS 15 BELOW LANDSCAPED AREAS

3. MINIMUM GRANULAR THICKNESS OVER LWF SHOULD BE AS FOLLOWS:
   FRONT PORCH 150mm OF OPSS GRANULAR A
   GARAGE 300mm OF OPSS GRANULAR A
   DRIVEWAY 450mm OF OPSS GRANULAR A

4. PLACEMENT OF LWF SHOULD BE ON A LEVELED SURFACE (SAND CAN BE USED TO PROVIDE AN ADEQUATE LEVELLING SURFACE).

patersongroup
consulting engineers

MATTAMY HOMES

EPS BLOCK INSTALLATION AROUND RESIDENTIAL BUILDINGS
SUMMERSIDE WEST RESIDENTIAL

Report No.:	Scale:
FIGURE 1	N.T.S.

Date:	Drawn:	Approved:
07/2019	MPG	DG

p:\autocad drawings\figures\pg0861-eps block installation.dwg

TABLE 2 - GRADING PLAN REVIEW AND FOUNDATION DESIGN DETAILS - CONVENTIONAL SINGLES AND TOWNS

Harmony - Stage 2 - Strandherd Drive - Ottawa

Lot Number or TH Block Number and Frontage Street Name	Existing Ground Surface Elevation (m)		Proposed Grade Front (m)	Proposed Grade Rear (m)	Underside of Footing Elevation (m)	Permissible Grade Raise Elevation	Engineered Fill Thickness (m)		Bearing Resistance at SLS/ULS (kPa)	Seismic Site Class	Minimum Lightweight Fill Extents	Lot or Block-Specific Notes
	Front	Rear					Front	Rear				
Lot 1: 67 Aura Avenue	91.90	91.90	94.09	93.55	92.29	94.00	0.69	0.69	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 2: 65 Aura Avenue	91.90	91.90	94.09	93.55	92.26	94.00	0.66	0.66	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 3: 63 Aura Avenue	91.95	91.95	94.07	93.53	92.27	94.00	0.62	0.62	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 4: 61 Aura Avenue	92.00	92.00	93.95	93.52	92.15	94.00	0.45	0.45	100/180	D	n/a	
Lot 5: 59 Aura Avenue	92.00	92.00	94.06	93.52	92.26	94.00	0.56	0.56	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 6: 57 Aura Avenue	92.00	92.00	93.87	93.65	92.45	94.00	0.75	0.75	100/180	D	n/a	
Lot 7: 55 Aura Avenue	92.05	92.05	94.06	93.52	92.26	94.00	0.51	0.51	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 8: 53 Aura Avenue	92.05	92.05	93.93	93.50	92.12	94.00	0.37	0.37	100/180	D	n/a	
Lot 9: 51 Aura Avenue	92.10	92.10	93.93	93.50	92.12	94.00	0.32	0.32	100/180	D	n/a	
Lot 10: 49 Aura Avenue	92.10	92.10	93.93	93.50	92.12	94.00	0.32	0.32	100/180	D	n/a	
Lot 11: 47 Aura Avenue	92.15	92.15	93.89	93.50	92.12	94.00	0.27	0.27	100/180	D	n/a	
Lot 12: 45 Aura Avenue	92.15	92.15	93.89	93.50	92.12	94.00	0.27	0.27	100/180	D	n/a	
Lot 13: 129 Paloma Circle	92.10	92.10	93.91	93.89	92.10	94.10	0.30	0.30	100/180	D	n/a	
Lot 14: 127 Paloma Circle	92.10	92.10	93.91	93.89	92.10	94.10	0.30	0.30	100/180	D	n/a	
Lot 15: 125 Paloma Circle	91.20	90.40	94.02	93.87	92.22	94.10	1.32	2.12	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill Edge of Fraser-Clarke Drain
Lot 16: 123 Paloma Circle	90.40	90.40	94.01	93.99	92.20	94.10	2.10	2.10	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill Fraser-Clarke Drain
Lot 17: 121 Paloma Circle	90.40	92.20	94.06	94.04	92.25	94.10	2.15	0.35	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill Fraser-Clarke Drain - Front
Lot 18: 103 Paloma Circle	90.70	92.20	94.11	94.26	92.30	94.10	1.90	0.40	100/180	D	1.0 m thick layer of LWF within garage and front porch	Parallel Channel to Linear SWM Pond will have to be filled at the front of these lots. The sides and rear should be outside the SWMP effects.
Lot 19: 101 Paloma Circle	90.70	92.20	94.08	94.06	92.27	94.10	1.87	0.37	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 20: 99 Paloma Circle	90.70	92.20	94.12	93.97	92.32	94.10	1.92	0.42	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 21: 97 Paloma Circle	90.70	92.25	94.11	94.09	92.30	94.10	1.90	0.35	100/180	D	1.0 m thick layer of LWF within garage and front porch	

TABLE 2 - GRADING PLAN REVIEW AND FOUNDATION DESIGN DETAILS - CONVENTIONAL SINGLES AND TOWNS

Harmony - Stage 2 - Strandherd Drive - Ottawa

Lot Number or TH Block Number and Frontage Street Name	Existing Ground Surface Elevation (m)		Proposed Grade Front (m)	Proposed Grade Rear (m)	Underside of Footing Elevation (m)	Permissible Grade Raise Elevation	Engineered Fill Thickness (m)		Bearing Resistance at SLS/ULS (kPa)	Seismic Site Class	Minimum Lightweight Fill Extents	Lot or Block-Specific Notes
	Front	Rear					Front	Rear				
Lot 22: 95 Paloma Circle	90.70	92.30	94.11	94.09	92.30	94.10	1.90	0.30	100/180	D	1.0 m thick layer of LWF within garage and front porch	Parallel Channel to Linear SWM Pond will have to be filled at the front of these lots. The sides and rear should be outside the SWMP effects.
Lot 23: 81 Paloma Circle	92.20	92.20	93.98	93.83	92.18	94.10	0.28	0.28	100/180	D	n/a	
Lot 24: 79 Paloma Circle	92.15	91.40	93.80	93.96	92.17	94.10	0.32	1.07	100/180	D	n/a	
Lot 25: 77 Paloma Circle	90.40	90.40	93.91	93.89	92.10	94.10	2.00	2.00	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill Fraser-Clarke Drain through lot
Lot 26: 75 Paloma Circle	90.40	92.10	93.91	93.89	92.10	94.10	2.00	0.30	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill Fraser-Clarke Drain - Front
Lot 27: 88 Paloma Circle	91.20	91.20	94.16	94.52	92.36	94.10	1.46	1.46	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill North edge of SWM Pond
Lot 28: 86 Paloma Circle	90.50	90.50	94.06	94.23	92.26	94.10	2.06	2.06	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill SWM Pond throughout lot
Lot 29: 84 Paloma Circle	92.15	90.50	94.01	94.16	92.21	94.10	0.36	2.01	100/180	D	n/a	Outlet channel from SWM Pond will have to be filled in the rear of these lots only. The sides and front should be unaffected.
Lot 30: 82 Paloma Circle	92.20	90.50	94.01	94.16	92.21	94.10	0.31	2.01	100/180	D	n/a	
Lot 31: 80 Paloma Circle	92.15	90.50	93.80	94.09	92.18	94.10	0.33	1.98	100/180	D	n/a	
Lot 32: 36 Aura Avenue	92.15	92.15	93.94	93.91	92.14	94.10	0.29	0.29	100/180	D	n/a	
Lot 33: 34 Aura Avenue	90.50	90.50	93.91	93.81	92.11	94.10	1.91	1.91	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill Outlet channel from SWM Pond - Probable
Lot 34: 32 Aura Avenue	90.50	90.50	93.79	93.94	92.17	94.10	1.97	1.97	100/180	D	1.0 m thick layer of LWF within garage and front porch	Fill Outlet channel from SWM Pond - Possible
Lot 35: 30 Aura Avenue	92.00	92.00	93.94	94.11	92.14	94.10	0.44	0.44	100/180	D	n/a	
Lot 36: 28 Aura Avenue	91.95	91.95	93.96	94.13	92.16	94.10	0.51	0.51	100/180	D	n/a	
Lot 37: 18 Aura Avenue	91.85	91.85	93.88	94.04	92.26	94.10	0.71	0.71	100/180	D	n/a	
Lot 38: 16 Aura Avenue	91.95	91.95	94.10	94.08	92.30	94.10	0.65	0.65	100/180	D	n/a	
Lot 39: 14 Aura Avenue	92.05	92.05	94.30	94.15	92.50	94.10	0.75	0.75	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 40: 12 Aura Avenue	92.10	92.10	94.26	94.43	92.46	94.10	0.66	0.66	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 41: 10 Aura Avenue	92.10	92.10	94.26	94.62	92.46	94.10	0.66	0.66	100/180	D	1.0 m thick layer of LWF within garage and front porch	

TABLE 2 - GRADING PLAN REVIEW AND FOUNDATION DESIGN DETAILS - CONVENTIONAL SINGLES AND TOWNS

Harmony - Stage 2 - Strandherd Drive - Ottawa

Lot Number or TH Block Number and Frontage Street Name	Existing Ground Surface Elevation (m)		Proposed Grade Front (m)	Proposed Grade Rear (m)	Underside of Footing Elevation (m)	Permissible Grade Raise Elevation	Engineered Fill Thickness (m)		Bearing Resistance at SLS/ULS (kPa)	Seismic Site Class	Minimum Lightweight Fill Extents	Lot or Block-Specific Notes
	Front	Rear					Front	Rear				
Lot 42: 11 Aura Avenue	92.10	92.10	94.27	94.45	92.29	94.10	0.49	0.49	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 43: 13 Aura Avenue	92.10	92.10	94.27	94.45	92.29	94.10	0.49	0.49	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 44: 15 Aura Avenue	92.05	92.05	94.30	94.15	92.50	94.10	0.75	0.75	100/180	D	1.0 m thick layer of LWF within garage and front porch	
Lot 45: 17 Aura Avenue	91.95	91.95	94.21	94.06	92.41	94.10	0.76	0.76	100/180	D	n/a	
Lot 46: 19 Aura Avenue	91.85	91.85	93.98	94.15	92.18	94.10	0.63	0.63	100/180	D	n/a	
Lot 47: 21 Aura Avenue	91.80	91.80	93.80	94.15	92.18	94.10	0.68	0.68	100/180	D	n/a	
Lot 48: 23 Aura Avenue	91.90	91.90	94.01	94.00	92.21	94.10	0.61	0.61	100/180	D	n/a	
Lot 49: 25 Aura Avenue	91.95	91.95	94.01	93.99	92.21	94.10	0.56	0.56	100/180	D	n/a	
Lot 50: 27 Aura Avenue	92.00	92.00	93.97	93.99	92.21	94.10	0.51	0.51	100/180	D	n/a	
TH-30N (F): 540 Clemency Cresc.	91.80	91.80	94.17	94.53	92.30	93.60	0.80	0.80	100/180	D	1.5 m thick layer of LWF within garage and front porch and 0.8 m thick layer of LWF extending horizontally 2.4 m beyond front face of building. 0.5 m thick layer of LWF extending 2.4 m horizontally beyond rear face of building and to property line along exterior sides of building.	
TH-30N (E): 542 Clemency Cresc.	91.80	91.80	94.17	94.53	92.30	93.60	0.80	0.80	100/180	D		
TH-30C (D): 544 Clemency Cresc.	91.40	91.40	94.17	94.53	92.30	93.60	1.20	1.20	100/180	D		Fill North Edge of Fraser-Clarke Drain
TH-30C (C): 546 Clemency Cresc.	91.40	91.40	94.17	94.53	92.30	93.60	1.20	1.20	100/180	D		
TH-30S (B): 548 Clemency Cresc.	90.40	90.40	94.17	94.53	92.30	93.60	2.20	2.20	100/180	D		Fill Fraser-Clarke Drain
TH-30S (A): 550 Clemency Cresc.	90.40	90.40	94.17	94.53	92.30	93.60	2.20	2.20	100/180	D		
TH-31N (F): 552 Clemency Cresc.	91.50	91.50	94.17	94.34	92.30	93.80	1.10	1.10	100/180	D	1.5 m thick layer of LWF within garage and front porch and 0.4 m thick layer of LWF extending horizontally 2.4 m beyond front face of building.	Fill South Edge of Fraser-Clarke Drain
TH-31N (E): 554 Clemency Cresc.	91.50	91.50	94.17	94.34	92.30	93.80	1.10	1.10	100/180	D		
TH-31C (D): 556 Clemency Cresc.	91.90	91.90	94.17	94.34	92.30	93.80	0.70	0.70	100/180	D		
TH-31C (C): 558 Clemency Cresc.	91.90	91.90	94.17	94.34	94.30	93.80	2.70	2.70	100/180	D		
TH-31S (B): 560 Clemency Cresc.	91.90	91.90	94.17	94.34	94.30	93.80	2.70	2.70	100/180	D		

TABLE 2 - GRADING PLAN REVIEW AND FOUNDATION DESIGN DETAILS - CONVENTIONAL SINGLES AND TOWNS

Harmony - Stage 2 - Strandherd Drive - Ottawa

Lot Number or TH Block Number and Frontage Street Name	Existing Ground Surface Elevation (m)		Proposed Grade Front (m)	Proposed Grade Rear (m)	Underside of Footing Elevation (m)	Permissible Grade Raise Elevation	Engineered Fill Thickness (m)		Bearing Resistance at SLS/ULS (kPa)	Seismic Site Class	Minimum Lightweight Fill Extents	Lot or Block-Specific Notes
	Front	Rear					Front	Rear				
TH-31S (A): 562 Clemency Cresc.	91.90	91.90	94.17	94.34	94.30	93.80	2.70	2.70	100/180	D	1.5 m thick layer of LWF within garage and front porch and 0.4 m thick layer of LWF extending horizontally 2.4 m beyond front face of building.	
TH-32N (D): 564 Clemency Cresc.	91.90	91.90	94.12	94.30	92.25	94.00	0.65	0.65	100/180	D	1.0 m thick layer of LWF within garage and front porch	
TH-32N (C): 566 Clemency Cresc.	91.90	91.90	94.12	94.30	92.25	94.00	0.65	0.65	100/180	D		
TH-32S (B): 568 Clemency Cresc.	91.90	91.90	94.12	94.30	92.25	94.00	0.65	0.65	100/180	D	1.0 m thick layer of LWF within garage and front porch	
TH-32S (A): 570 Clemency Cresc.	91.90	91.90	94.12	94.30	92.25	94.00	0.65	0.65	100/180	D		
TH-33 (C): 107 Aura Ave.	91.80	91.80	94.14	93.85	92.27	93.80	0.77	0.77	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-33 (B): 105 Aura Ave.	91.80	91.80	94.14	93.85	92.27	93.80	0.77	0.77	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-33 (A): 103 Aura Ave.	91.80	91.80	94.14	93.85	92.27	93.80	0.77	0.77	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-34W (D): 101 Aura Ave.	91.80	91.80	94.12	93.83	92.25	93.80	0.75	0.75	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-34W (C): 99 Aura Ave.	91.80	91.80	94.12	93.83	92.25	93.80	0.75	0.75	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-34E (B): 97 Aura Ave.	91.80	91.80	94.12	93.83	92.25	93.80	0.75	0.75	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-34E (A): 95 Aura Ave.	91.80	91.80	94.12	93.83	92.25	93.80	0.75	0.75	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-35W (F): 93 Aura Ave.	91.85	91.85	94.08	93.80	92.22	93.80	0.67	0.67	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-35W (E): 91 Aura Ave.	91.85	91.85	94.08	93.80	92.22	93.80	0.67	0.67	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-35W (D): 89 Aura Ave.	91.85	91.85	94.08	93.80	92.22	93.80	0.67	0.67	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-35E (C): 87 Aura Ave.	91.85	91.85	94.08	93.80	92.22	93.80	0.67	0.67	100/180	D	1.5 m thick layer of LWF within garage and front porch.	

TABLE 2 - GRADING PLAN REVIEW AND FOUNDATION DESIGN DETAILS - CONVENTIONAL SINGLES AND TOWNS

Harmony - Stage 2 - Strandherd Drive - Ottawa

Lot Number or TH Block Number and Frontage Street Name	Existing Ground Surface Elevation (m)		Proposed Grade Front (m)	Proposed Grade Rear (m)	Underside of Footing Elevation (m)	Permissible Grade Raise Elevation	Engineered Fill Thickness (m)		Bearing Resistance at SLS/ULS (kPa)	Seismic Site Class	Minimum Lightweight Fill Extents	Lot or Block-Specific Notes
	Front	Rear					Front	Rear				
TH-35E (B): 85 Aura Ave.	91.85	91.85	94.08	93.80	92.22	93.80	0.67	0.67	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-35E (A): 83 Aura Ave.	91.85	91.85	94.08	93.80	92.22	93.80	0.67	0.67	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-36W (F): 81 Aura Ave.	91.90	91.90	94.03	93.74	92.17	93.80	0.57	0.57	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-36W (E): 79 Aura Ave.	91.90	91.90	94.03	93.74	92.17	93.80	0.57	0.57	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-36W (D): 77 Aura Ave.	91.90	91.90	94.03	93.74	92.17	93.80	0.57	0.57	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-36E (C): 75 Aura Ave.	91.90	91.90	94.03	93.74	92.17	93.80	0.57	0.57	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-36E (B): 73 Aura Ave.	91.90	91.90	94.03	93.74	92.17	93.80	0.57	0.57	100/180	D	1.5 m thick layer of LWF within garage and front porch.	
TH-36E (A): 71 Aura Ave.	91.90	91.90	94.03	93.74	92.17	93.80	0.57	0.57	100/180	D	1.5 m thick layer of LWF within garage and front porch.	

Notes:

1. Proposed grading information has been established for review based on Grading Plans, Drawing Nos G1 and G2, Revision 11, July 19, 2019, J.L. Richards and Associates Ltd. Project No. 24051-002.
2. Updated grading information has been established for review based on Site/Grading Plan, Drawing No S-2, Revision 3 dated August 13, 2019, Minto.

TABLE 1 - GRADING PLAN REVIEW AND FOUNDATION DESIGN DETAILS - BACK-TO-BACK TOWN HOMES

Harmony - Stage 2 - Ottawa

Lot or Block Number and Frontage Street Name	Existing Ground Surface (m)	Proposed Grade Garage (m)	Permissible Grade Raise Elevation (m)	Underside of Footing El. (m)	Engineered Fill Thickness (m)	Bearing Resistance at SLS/ULS	Seismic Site Class	Minimum Lightweight Fill Extents	Block-Specific Notes
TH-23 NW (H) 200 Libbe Terrace	92.10	94.24	94.00	92.30	0.50	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	Linear SWM Pond passes west to east through north half of block. Use suitable native silty clay engineered fill capped with min. 500 mm thick layer of granular fill.
TH-23 NE (G) 106 Paloma Circle	92.10	94.24	94.00	92.30	0.50	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	
TH-23 NCW (I) 202 Libbe Terrace	90.50	94.24	94.00	92.30	2.10	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-23 NCW (J) 204 Libbe Terrace	90.50	94.24	94.00	92.30	2.10	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-23 NCE (E) 110 Paloma Circle	90.50	94.24	94.00	92.30	2.10	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-23 NCE (F) 108 Paloma Circle	90.50	94.24	94.00	92.30	2.10	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-23 CW (K) 206 Libbe Terrace	90.70	94.24	94.00	92.30	1.90	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-23 CE (D) 112 Paloma Circle	90.70	94.24	94.00	92.30	1.90	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-23 SCW (L) 208 Libbe Terrace	92.15	94.24	94.00	92.30	0.45	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	
TH-23 SCW (M) 210 Libbe Terrace	92.15	94.24	94.00	92.30	0.45	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	
TH-23 SCE (B) 116 Paloma Circle	92.15	94.24	94.00	92.30	0.45	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	
TH-23 SCE (C) 114 Paloma Circle	92.15	94.24	94.00	92.30	0.45	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	
TH-23 SW (N) 212 Libbe Terrace	90.40	94.24	94.00	92.30	2.20	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-23 SE (A) 118 Paloma Circle	90.40	94.24	94.00	92.30	2.20	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 NW (F) 528 Clemency Crescent	92.10	94.42	94.00	92.30	0.50	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	Linear SWM Pond plus buried storm sewer passes through northeast part of block. Fraser-Clarke Drain passes west to east through central/south part of block. Use suitable native silty clay engineered fill capped with min. 500 mm thick layer of granular fill.
TH-24 NW (G) 526 Clemency Crescent	92.10	94.42	94.00	92.30	0.50	100/150	D	0.4 m thick layer of LWF across entire building interior footprint	
TH-24 NE (D) 203 Libbe Terrace	90.50	94.42	94.00	92.30	2.10	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 NE (E) 201 Libbe Terrace	90.50	94.42	94.00	92.30	2.10	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 SCW (H) 524 Clemency Crescent	90.40	94.42	94.00	92.30	2.20	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 SCW (I) 522 Clemency Crescent	90.40	94.42	94.00	92.30	2.20	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 SCE (B) 207 Libbe Terrace	90.40	94.42	94.00	92.30	2.20	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 SCE (C) 205 Libbe Terrace	90.40	94.42	94.00	92.30	2.20	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 SW (J) 520 Clemency Crescent	90.90	94.42	94.00	92.30	1.70	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-24 SE (A) 209 Libbe Terrace	90.90	94.42	94.00	92.30	1.70	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-25 NW (F) 518 Clemency Crescent	92.15	94.22	94.00	92.10	0.25	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	Existing ground profile anticipated to be relatively uniform.
TH-25 NW (G) 516 Clemency Crescent	92.15	94.22	94.00	92.10	0.25	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 NW (H) 514 Clemency Crescent	92.15	94.22	94.00	92.10	0.25	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 NE (C) 215 Libbe Terrace	92.20	94.22	94.00	92.10	0.20	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 NE (D) 213 Libbe Terrace	92.20	94.22	94.00	92.10	0.20	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 NE (E) 211 Libbe Terrace	92.20	94.22	94.00	92.10	0.20	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 SW (I) 512 Clemency Crescent	92.15	94.22	94.00	92.10	0.25	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 SW (J) 510 Clemency Crescent	92.15	94.22	94.00	92.10	0.25	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 SE (A) 219 Libbe Terrace	92.20	94.22	94.00	92.10	0.20	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-25 SE (B) 217 Libbe Terrace	92.20	94.22	94.00	92.10	0.20	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-26 NW (F) 508 Clemency Crescent	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	Existing ground profile anticipated to be relatively uniform.
TH-26 NW (G) 506 Clemency Crescent	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 NW (H) 504 Clemency Crescent	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 NE (C) 225 Libbe Terrace	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 NE (D) 223 Libbe Terrace	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 NE (E) 221 Libbe Terrace	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 SW (I) 502 Clemency Crescent	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 SW (J) 500 Clemency Crescent	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 SE (A) 229 Libbe Terrace	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	
TH-26 SE (B) 227 Libbe Terrace	92.10	94.15	94.00	92.03	0.25	100/150	D	n/a	

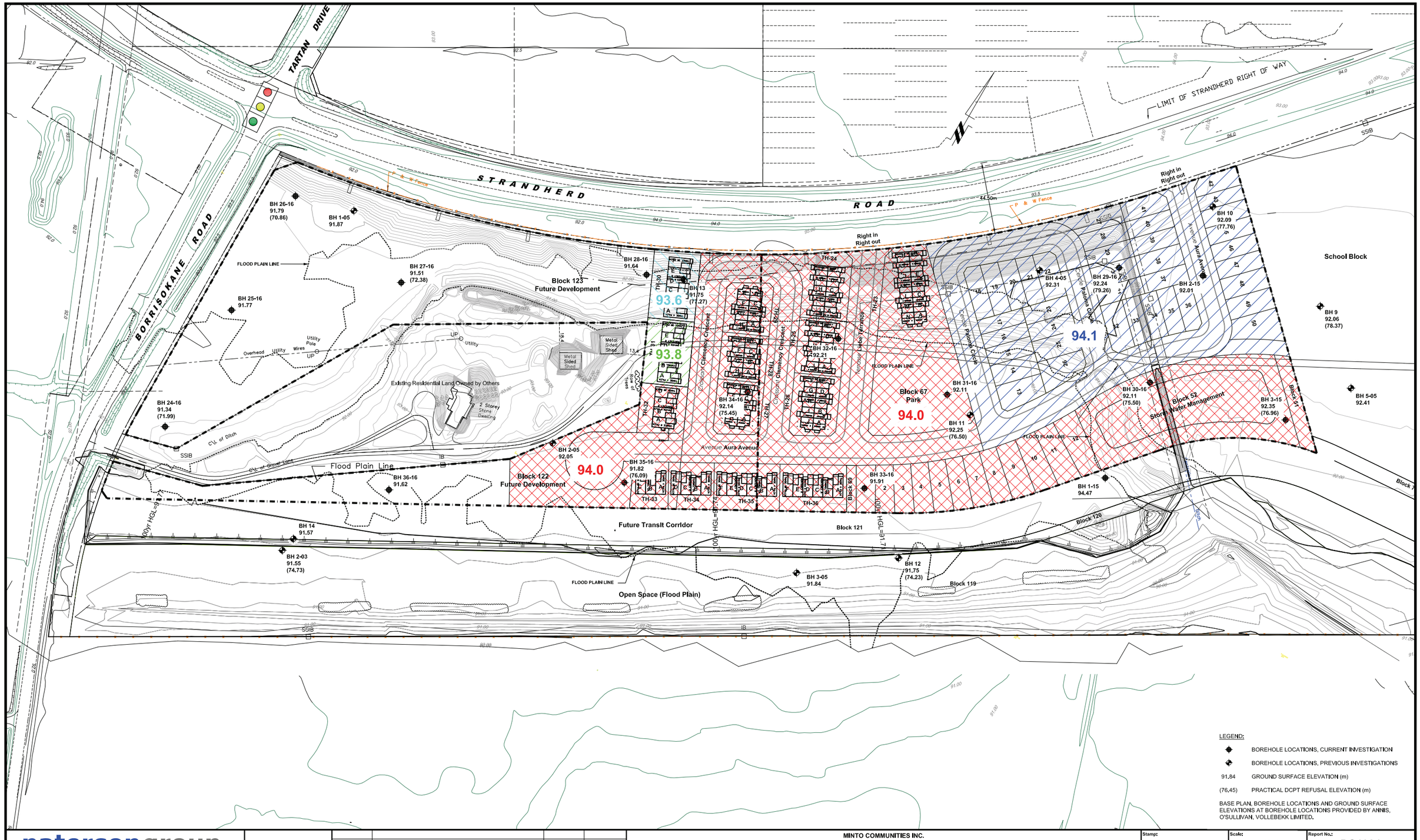
TABLE 1 - GRADING PLAN REVIEW AND FOUNDATION DESIGN DETAILS - BACK-TO-BACK TOWN HOMES

Harmony - Stage 2 - Ottawa

Lot or Block Number and Frontage Street Name	Existing Ground Surface (m)	Proposed Grade Garage (m)	Permissible Grade Raise Elevation (m)	Underside of Footing El. (m)	Engineered Fill Thickness (m)	Bearing Resistance at SLS/ULS	Seismic Site Class	Minimum Lightweight Fill Extents	Block-Specific Notes
TH-27 NW (E) 563 Clemency Crescent	92.10	94.17	94.00	92.05	0.25	100/150	D	n/a	Existing ground profile anticipated to be relatively uniform.
TH-27 NW (F) 565 Clemency Crescent	92.10	94.17	94.00	92.05	0.25	100/150	D	n/a	
TH-27 NE (C) 505 Clemency Crescent	92.15	94.17	94.00	92.05	0.20	100/150	D	n/a	
TH-27 NE (D) 507 Clemency Crescent	92.15	94.17	94.00	92.05	0.20	100/150	D	n/a	
TH-27 SW (G) 506 Clemency Crescent	92.10	94.17	94.00	92.05	0.25	100/150	D	n/a	
TH-27 SW (H) 504 Clemency Crescent	92.10	94.17	94.00	92.05	0.25	100/150	D	n/a	
TH-27 SE (A) 563 Clemency Crescent	92.10	94.17	94.00	92.05	0.25	100/150	D	n/a	
TH-27 SE (B) 565 Clemency Crescent	92.10	94.17	94.00	92.05	0.25	100/150	D	n/a	
TH-28 NW (E) 555 Clemency Crescent	92.10	94.22	94.00	92.10	0.30	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	Existing ground profile anticipated to be relatively uniform.
TH-28 NW (F) 557 Clemency Crescent	92.10	94.22	94.00	92.10	0.30	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-28 NE (C) 513 Clemency Crescent	92.10	94.22	94.00	92.10	0.30	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-28 NE (D) 515 Clemency Crescent	92.10	94.22	94.00	92.10	0.30	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-28 SW (G) 559 Clemency Crescent	92.15	94.22	94.00	92.10	0.25	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-28 SW (H) 561 Clemency Crescent	92.15	94.22	94.00	92.10	0.25	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-28 SE (A) 509 Clemency Crescent	92.10	94.22	94.00	92.10	0.30	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-28 SE (B) 511 Clemency Crescent	92.10	94.22	94.00	92.10	0.30	100/150	D	0.3 m thick layer of LWF across entire building interior footprint	
TH-29 NW (E) 547 Clemency Crescent	90.40	94.37	94.00	92.25	2.15	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	Fraser-Clarke Drain passes west to east through north half of block. Use suitable native silty clay engineered fill capped with min. 500 mm thick layer of granular fill.
TH-29 NW (F) 549 Clemency Crescent	90.40	94.37	94.00	92.25	2.15	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-29 NE (C) 521 Clemency Crescent	90.40	94.37	94.00	92.25	2.15	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-29 NE (D) 523 Clemency Crescent	90.40	94.37	94.00	92.25	2.15	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-29 SW (G) 551 Clemency Crescent	90.90	94.37	94.00	92.25	1.65	100/150	D	0.8 m thick layer of LWF across entire building interior footprint	
TH-29 SW (H) 553 Clemency Crescent	91.40	94.37	94.00	92.25	1.15	100/150	D	0.5 m thick layer of LWF across entire building interior footprint	
TH-29 SE (A) 517 Clemency Crescent	91.50	94.37	94.00	92.25	1.05	100/150	D	0.5 m thick layer of LWF across entire building interior footprint	
TH-29 SE (B) 519 Clemency Crescent	91.50	94.37	94.00	92.25	1.05	100/150	D	0.5 m thick layer of LWF across entire building interior footprint	

Notes:

1. Proposed and original grading information has been established for review based on Grading Plans, Drawing Nos G1 and G2, Revision 11, July 19, 2019, J.L. Richards and Associates Ltd. Project No. 24051-002.
1. Updated grading information has been established for
2. Footings for Back-to-Back (slab-on-grade) units require a min. 1.5 m soil cover to provide adequate frost protection. Alternatively, footings could be raised provided sufficient rigid insulation is in place below the building perimeter as determined by the geotechnical engineer. It should be noted that the current design USF elevations provide 2.1 m of soil cover, which is not required from a geotechnical perspective.
3. Lightweight fill within the building footprint should consist of a EPS Type 19 covered by a polyethylene liner followed by a minimum 500 mm cover of Granular A crushed stone compacted to min. 98% of its SPMDD. Interior pad footings should extend below the LWF layer.



LEGEND:

- ◆ BOREHOLE LOCATIONS, CURRENT INVESTIGATION
- ◆ BOREHOLE LOCATIONS, PREVIOUS INVESTIGATIONS
- 91.84 GROUND SURFACE ELEVATION (m)
- (76.45) PRACTICAL DCPT REFUSAL ELEVATION (m)

BASE PLAN, BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED.

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consulting engineers

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Ottawa, Ontario K2E 7J5
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NO.	REVISIONS	DATE	INITIAL
2	BASE PLAN UPDATED	26/11/2018	DJG
1	BASE PLAN UPDATED	01/12/2016	AJT

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
PROPOSED MIXED DEVELOPMENT - CLARKE LANDS STAGE 2 - STRANDHERD DRIVE
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Stamp:

Scale:	1:1000
Drawn by:	MPG
Checked by:	AJT
Approved by:	AJT
Date:	09/2016
Report No.:	PG1984
Drawing No.:	PG1984-9
Revision No.:	2

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

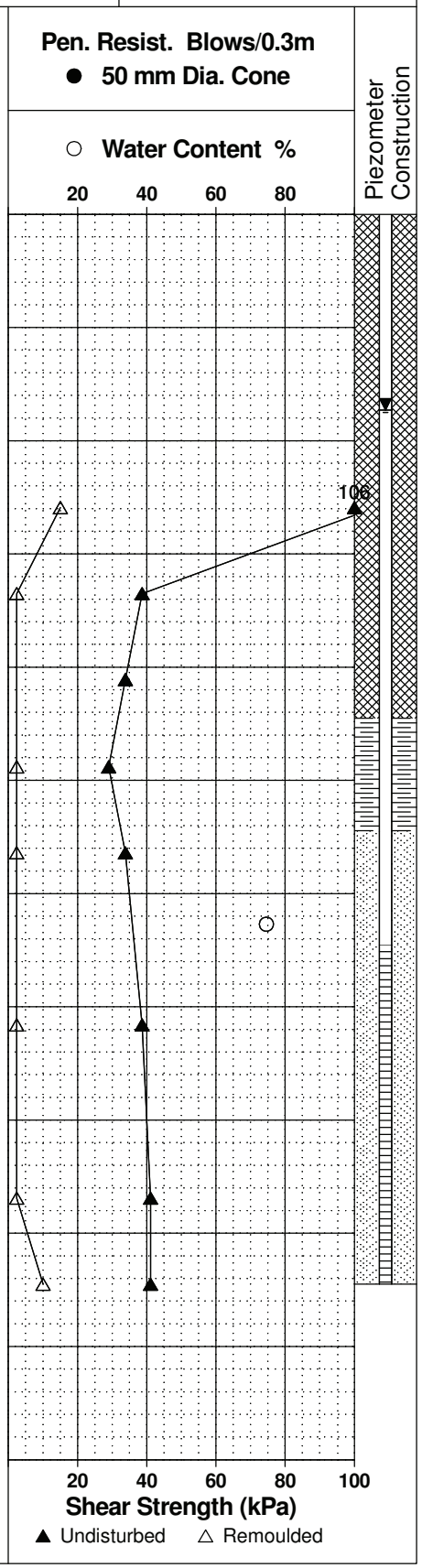
FILE NO. PG1984

REMARKS

HOLE NO. BH29-16

BORINGS BY CME 55 Power Auger **DATE** July 14, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.24
FILL: Brown silty clay							
0.30							
TOPSOIL		SS	1	79	13		
0.46							
		SS	2	62	13	1	91.24
Very stiff, brown **SILTY CLAY,** some sand seams		SS	3	100	4	2	90.24
2.70							
						3	89.24
						4	88.24
						5	87.24
Firm, grey **SILTY CLAY**							
						6	86.24
		TW	4	100			
						7	85.24
		TW	5	100			
						8	84.24
						9	83.24
9.45							
Dynamic Cone Penetration Test commenced at 9.45m depth. Cone pushed to 11.4m depth.						10	82.24
						11	81.24



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

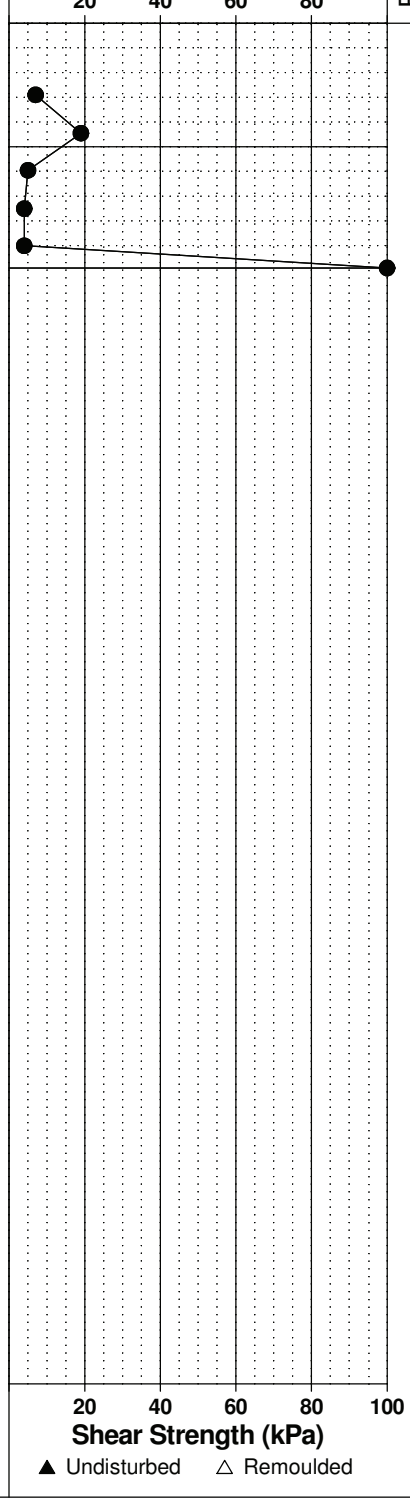
FILE NO. PG1984

REMARKS

HOLE NO. BH29-16

BORINGS BY CME 55 Power Auger **DATE** July 14, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
Inferred firm to stiff cohesive soil over compact to dense glacial till.						11	81.24		
						12	80.24		
12.98									
End of Borehole Practical DCPT refusal at 12.98m depth. (GWL @ 1.73m-August 4, 2016)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

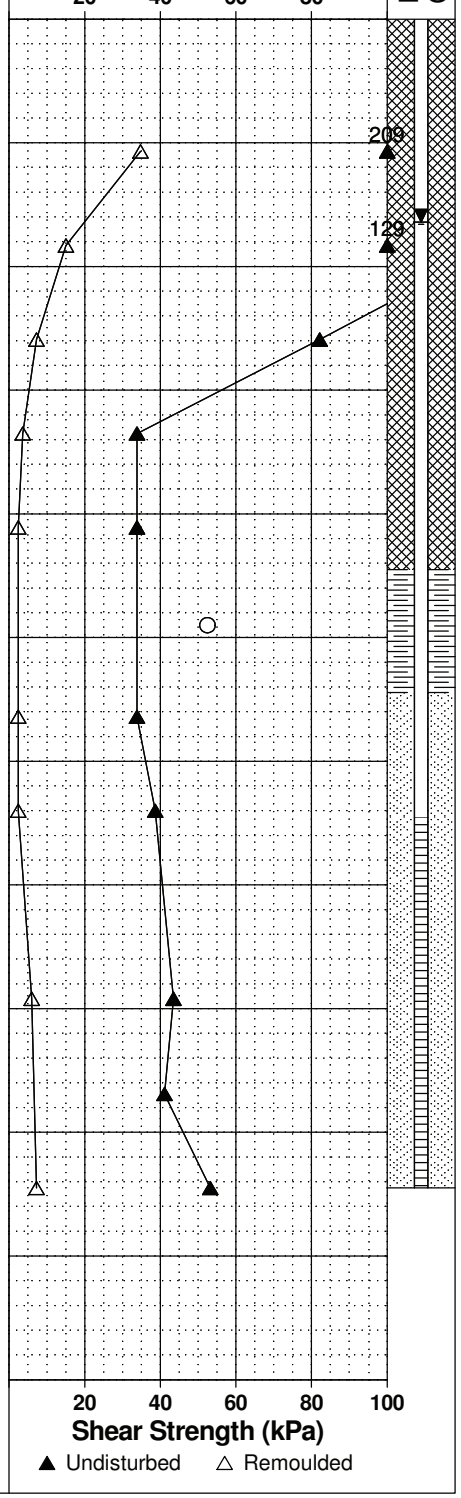
FILE NO. PG1984

REMARKS

HOLE NO. BH30-16

BORINGS BY CME 55 Power Auger **DATE** July 15, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.11
TOPSOIL 0.15		SS	1		9		
		G	2			1	91.11
Hard to very stiff, brown **SILTY CLAY,** some sand		G	3			2	90.11
2.70		G	4				
		G	5			3	89.11
						4	88.11
		TW	6	100		5	87.11
Stiff to firm, grey **SILTY CLAY**		G	7			6	86.11
		TW	8	100		7	85.11
						8	84.11
						9	83.11
9.45							
Dynamic Cone Penetration Test commenced at 9.45m depth. Cone pushed to 12.1m depth.						10	82.11
						11	81.11



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

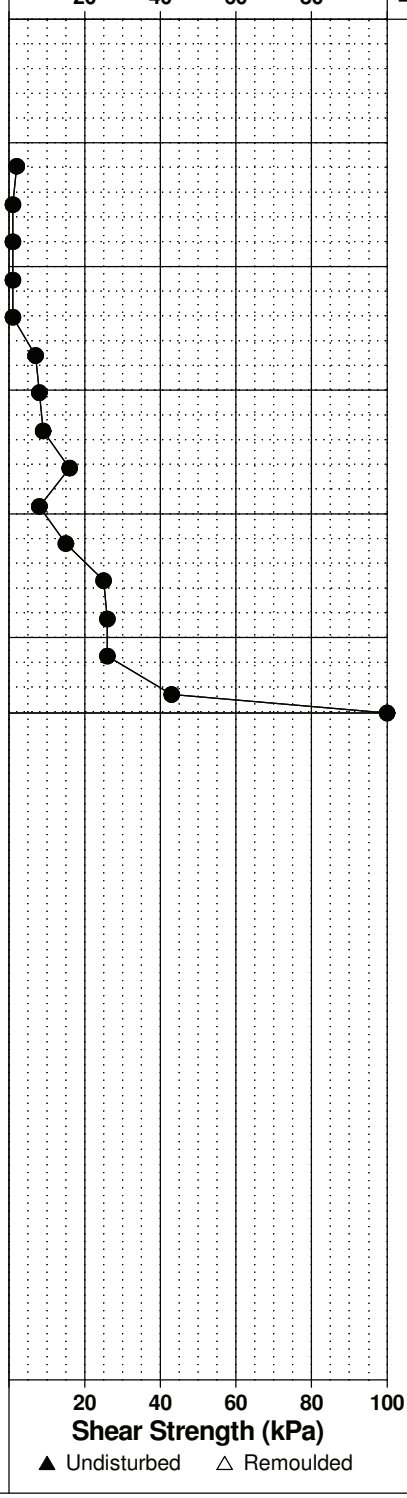
FILE NO. PG1984

REMARKS

HOLE NO. BH30-16

BORINGS BY CME 55 Power Auger **DATE** July 15, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
Inferred firm to stiff cohesive soil over compact to dense glacial till.						11	81.11		
						12	80.11		
						13	79.11		
						14	78.11		
						15	77.11		
						16	76.11		
16.61									
End of Borehole Practical DCPT refusal at 16.61m depth (GWL @ 1.64m-August 4, 2016)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

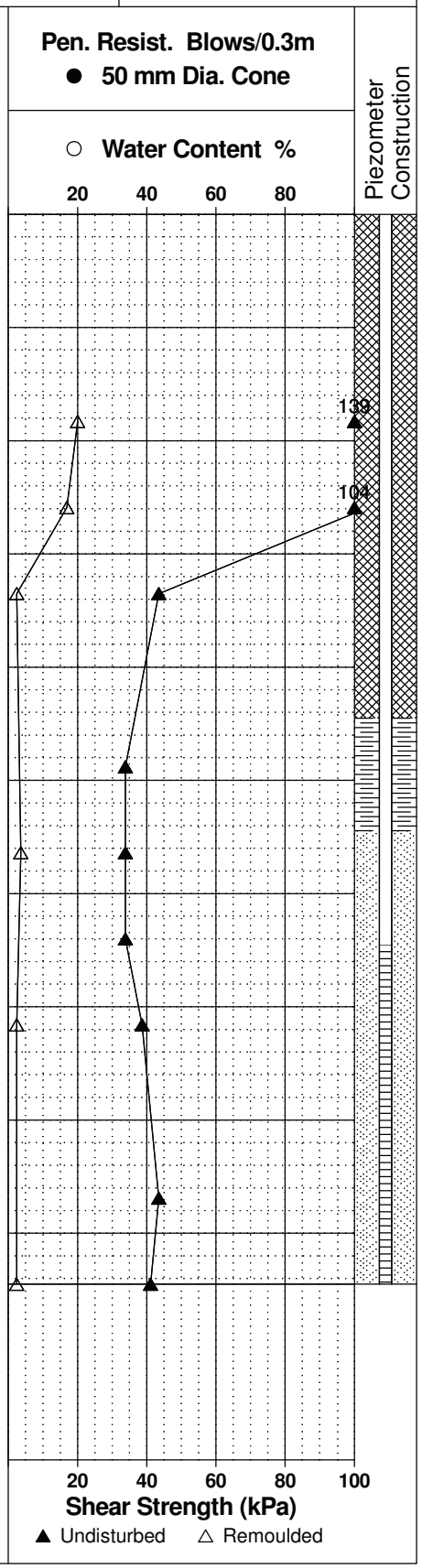
FILE NO. PG1984

REMARKS

HOLE NO. BH31-16

BORINGS BY CME 55 Power Auger **DATE** July 15, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.11
TOPSOIL 0.20		SS	1	79	9		
		SS	2	100	5	1	91.11
Very stiff, brown **SILTY CLAY,** some sand						2	90.11
2.70							
Firm, grey **SILTY CLAY**						3	89.11
		TW	3	100		4	88.11
						5	87.11
						6	86.11
						7	85.11
		TW	4	100		8	84.11
						9	83.11
9.45							
End of Borehole							
(Piezometer blocked at 1.78m depth - August 4, 2016)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

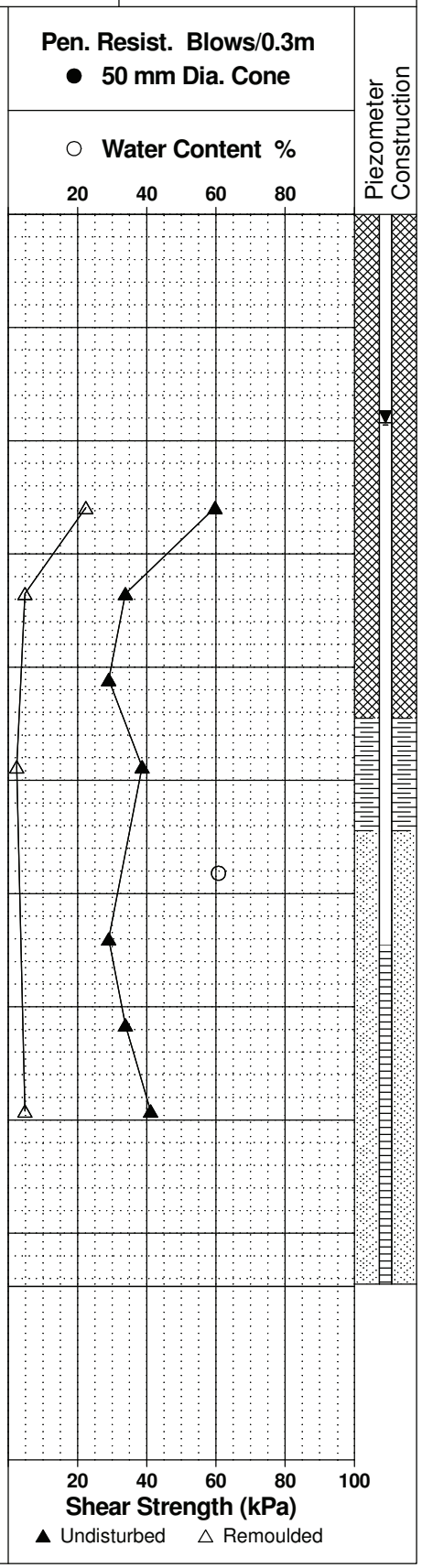
FILE NO. PG1984

REMARKS

HOLE NO. BH32-16

BORINGS BY CME 55 Power Auger **DATE** July 15, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.21
TOPSOIL 0.15		SS	1	62	17		
Compact, brown **SILT,** trace sand						1	91.21
1.07		SS	2	71	14		
Very stiff, brown **SILTY CLAY,** trace sand		SS	3	71	6	2	90.21
2.20							
						3	89.21
						4	88.21
						5	87.21
Stiff to firm, grey **SILTY CLAY**		TW	4	100			
						6	86.21
						7	85.21
						8	84.21
		TW	5	100			
						9	83.21
		SS	6	100	7		
9.47							
End of Borehole							
(GWL @ 1.84m-August 4, 2016)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

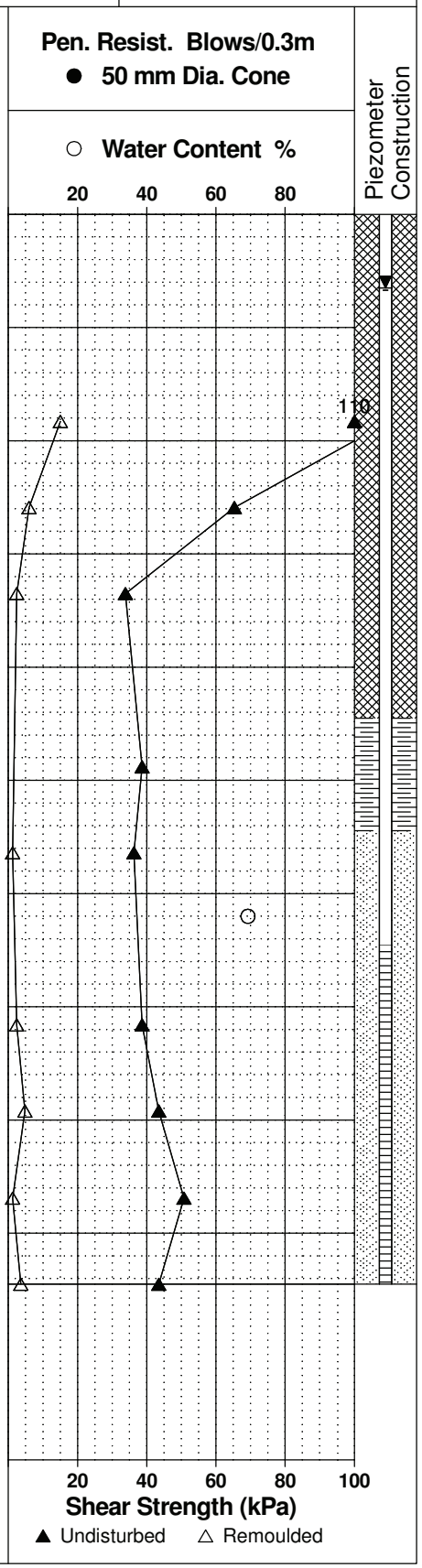
FILE NO. PG1984

REMARKS

HOLE NO. BH33-16

BORINGS BY CME 55 Power Auger **DATE** July 18, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	91.91
TOPSOIL 0.18		SS	1	62	7		
Very stiff, brown **SILTY CLAY,** some sand		SS	2	100	5	1	90.91
						2	89.91
2.70						3	88.91
		TW	3	100		4	87.91
						5	86.91
Stiff to firm, grey **SILTY CLAY**						6	85.91
		TW	4	100		7	84.91
						8	83.91
9.45						9	82.91
End of Borehole							
(GWL @ 0.65m-August 4, 2016)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

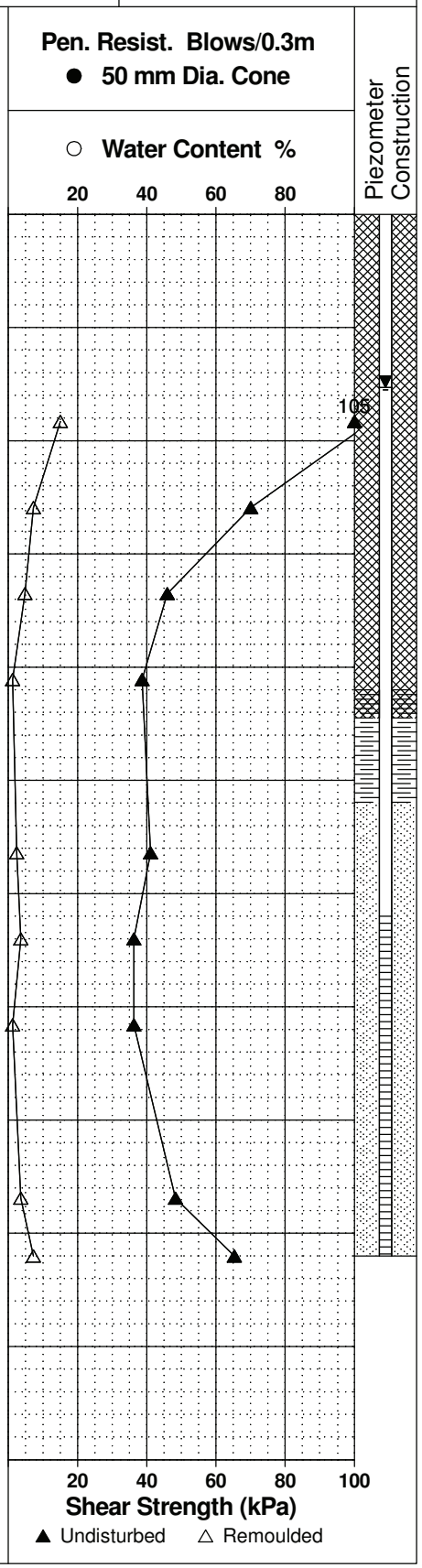
FILE NO. PG1984

REMARKS

HOLE NO. BH34-16

BORINGS BY CME 55 Power Auger **DATE** July 18, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.14
TOPSOIL 0.15		SS	1	67	9		
Very stiff to stiff, brown **SILTY CLAY,** some sand		SS	2	100	6	1	91.14
						2	90.14
2.80						3	89.14
						4	88.14
		TW	3	99		5	87.14
Firm to stiff, grey **SILTY CLAY**						6	86.14
						7	85.14
		TW	4	100		8	84.14
						9	83.14
9.45							
Dynamic Cone Penetration Test commenced at 9.45m depth. Cone pushed to 15.2m depth.						10	82.14
						11	81.14



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

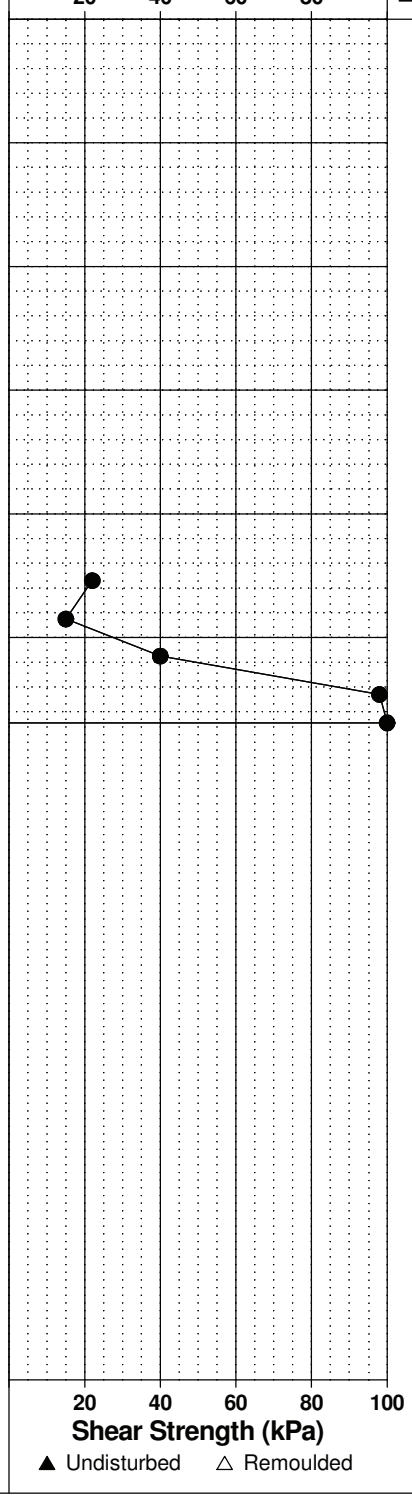
FILE NO. PG1984

REMARKS

HOLE NO. BH34-16

BORINGS BY CME 55 Power Auger **DATE** July 18, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
Inferred firm to stiff cohesive soil over compact to dense glacial till.						11	81.14		
						12	80.14		
						13	79.14		
						14	78.14		
						15	77.14		
						16	76.14		
16.69									
End of Borehole Practical DCPT refusal at 16.69m depth. (GWL @ 1.53m-August 4, 2016)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

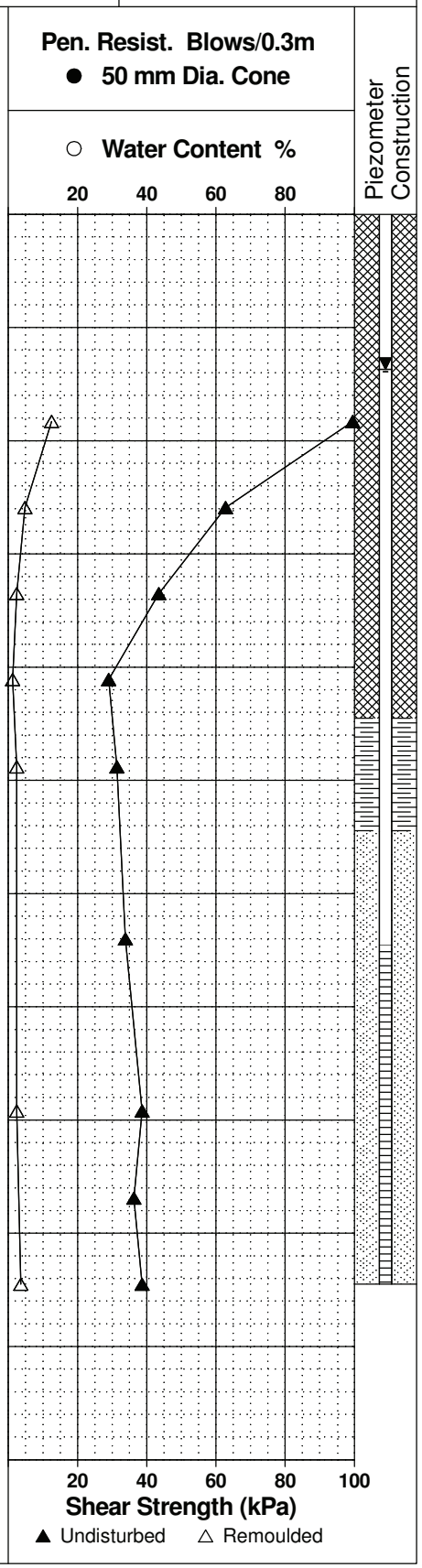
FILE NO. PG1984

REMARKS

HOLE NO. BH35-16

BORINGS BY CME 55 Power Auger **DATE** July 18, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	91.82
TOPSOIL 0.20							
Brown **CLAYEY SILT** with sand 0.46		SS	1	50	6		
		SS	2	100	4	1	90.82
Very stiff to stiff, brown **SILTY CLAY**						2	89.82
2.70							
						3	88.82
						4	87.82
						5	86.82
Firm, grey **SILTY CLAY**		TW	3	100			
						6	85.82
		TW	4	100		7	84.82
						8	83.82
						9	82.82
9.45							
Dynamic Cone Penetration Test commenced at 9.45m depth. Cone pushed to 12.8m depth.						10	81.82
						11	80.82



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Mixed Development - Clarke Lands Stage 2
Strandherd Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by J.L. Richards and Associates Ltd.

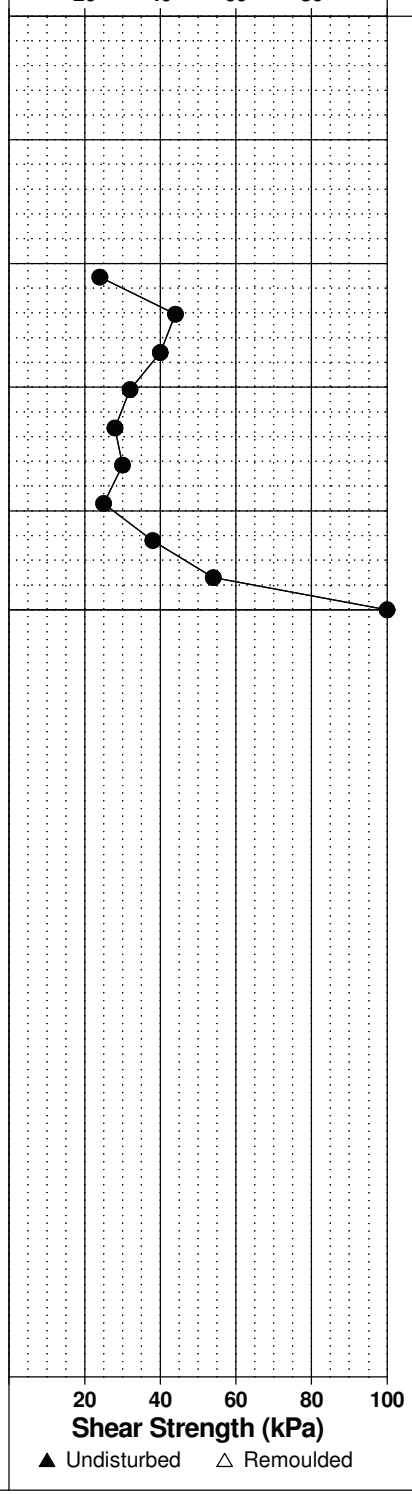
FILE NO. PG1984

REMARKS

HOLE NO. BH35-16

BORINGS BY CME 55 Power Auger **DATE** July 18, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
Inferred firm to stiff cohesive soil over compact to dense glacial till.						11	80.82		
						12	79.82		
						13	78.82		
						14	77.82		
						15	76.82		
15.80									
End of Borehole Practical DCPT refusal at 15.80m depth (GWL @ 1.37m-August 4, 2016)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Clarke Lands, Cedarview Road at Strandherd Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Consulting Ltd.

FILE NO. PG0706

REMARKS

HOLE NO. BH2-05

BORINGS BY CME 55 Power Auger **DATE** October 12, 2005

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.05
TOPSOIL 0.33		AU	1				
Very stiff to stiff, brown **SILTY CLAY**, trace sand seams		SS	2	75	6	1	91.05
		SS	3	100	4	2	90.05
						3	89.05
- firm and grey by 3.4m depth		SS	4	0	6		
		TW	5	98		4	88.05
						5	87.05
		TW	6	85		6	86.05
						7	85.05
		SS	7	100	1	8	84.05
9.75		TW	8	81		9	83.05
GLACIAL TILL: Loose to compact, grey silty sand with gravel, cobbles and boulders		SS	9	50	6	10	82.05
		SS	10	75	7	11	81.05
						12	80.05
12.80		SS	11	83	11		
End of Borehole							
(GWL @ 1.26m-Nov. 25/05)